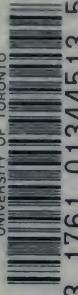


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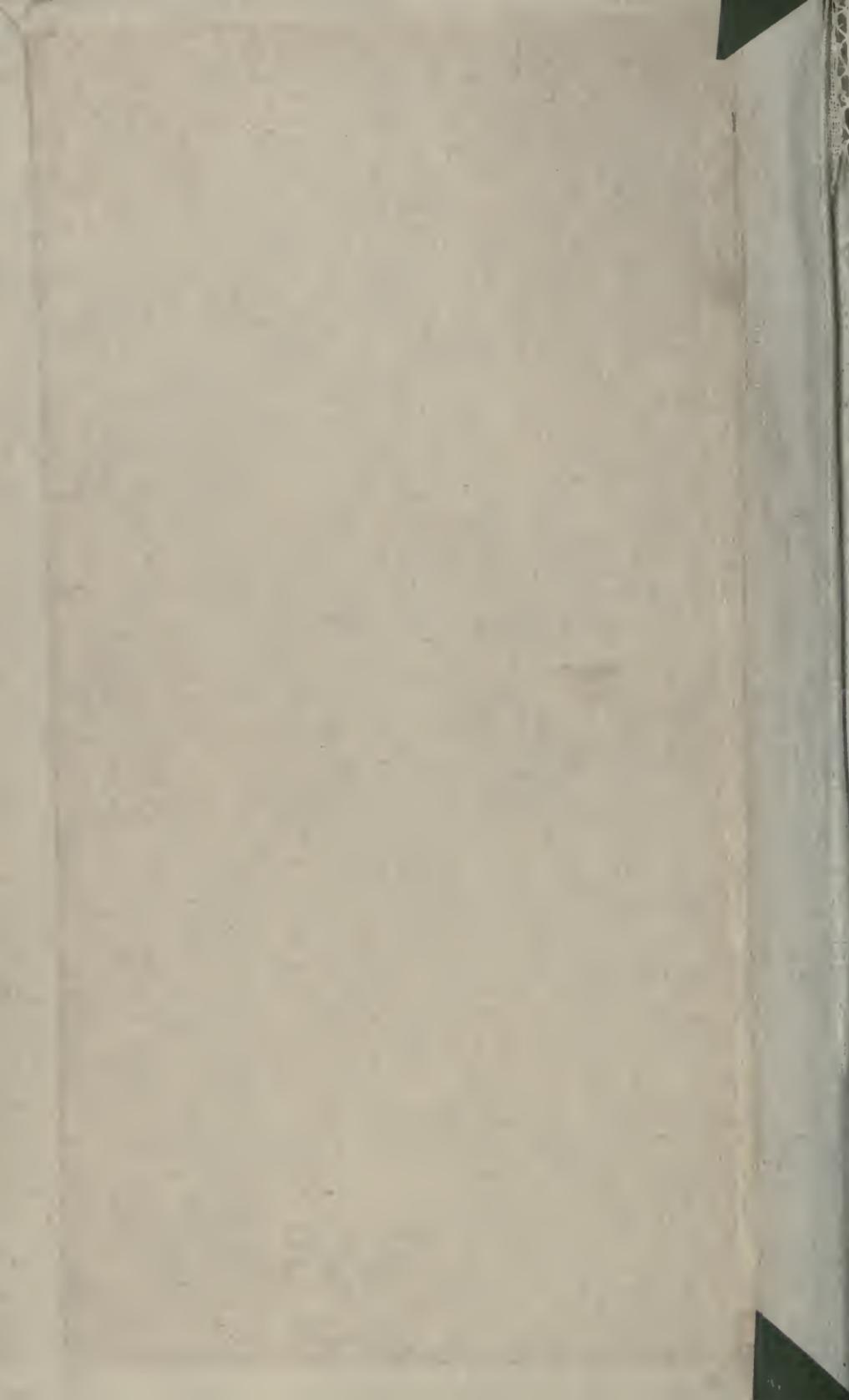
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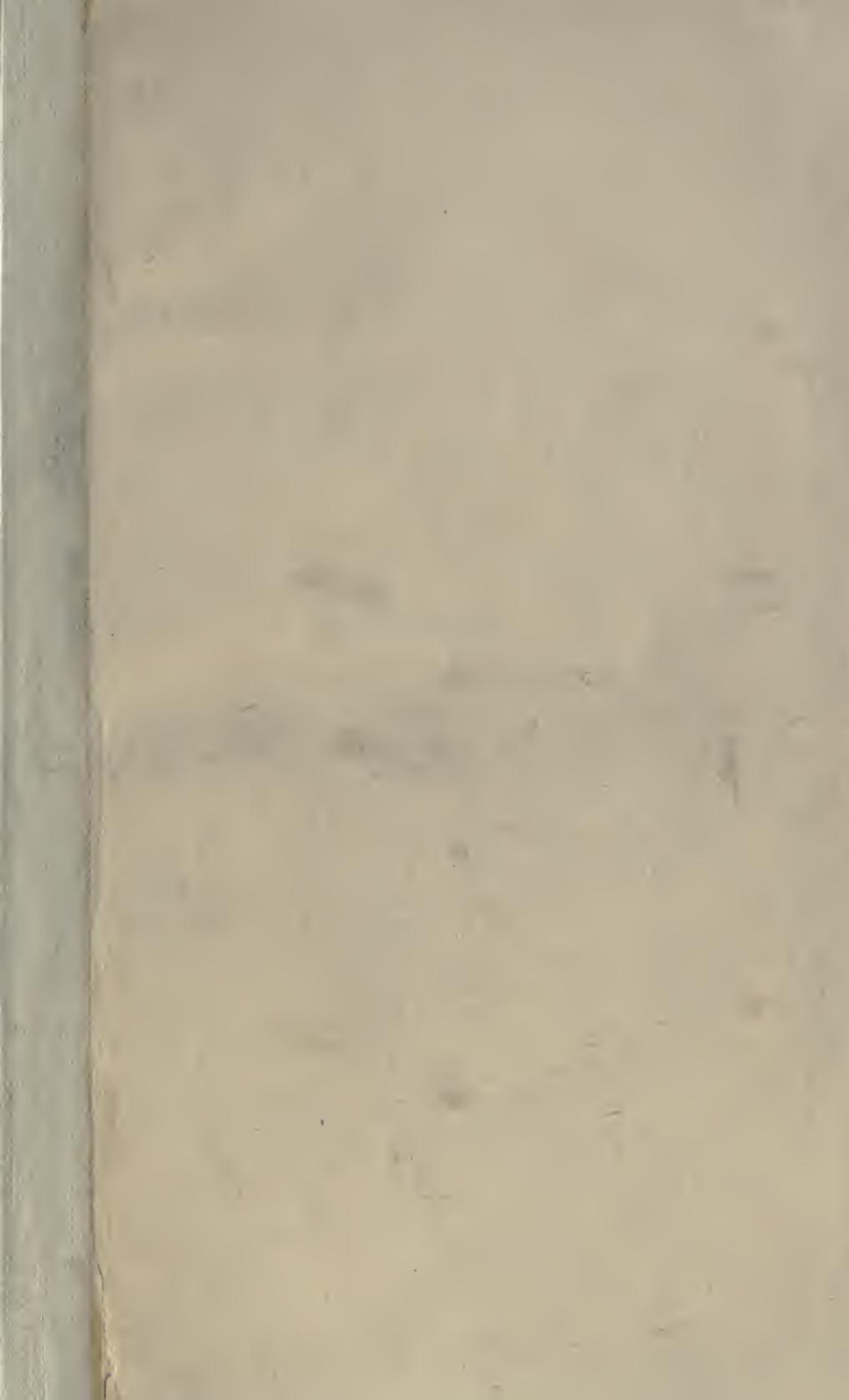
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MASSAGE  
ITS PRINCIPLES AND PRACTICE



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# MASSAGE

## ITS PRINCIPLES AND PRACTICE

BY

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"The Treatment of Fractures by Mobilisation and Massage."

WITH AN INTRODUCTION

BY

**SIR ROBERT JONES, K.B.E., C.B.,**

F.R.C.S., Maj.-Gen. A.M.S.,

Inspector of Special Military Surgery.

SECOND EDITION.

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## PREFACE TO THE SECOND EDITION.

THE kind reception of the first edition to this work has obliged me to decide whether to be content with a reprint, or whether rather to undertake a complete revision. It was with reluctance that I chose the harder course. I felt I could not leave altogether unfilled the many gaps disclosed, when comparing the daily routine of practice with what I had deemed would suffice. Even now I am painfully conscious of a number of matters of detail still omitted, but trust that the additions made justify my attempt to render the book less incomplete and more generally serviceable. My hope is that what has been added, despite admitted incompleteness and imperfections, may act as a further stimulant of thought and reflection in my readers. Otherwise the revision fails to attain the only justifiable object the book itself can have, namely, the advancement of the cause of physical therapy and the consequent advantage of the ever-increasing number of its beneficiaries. The day has passed when it was enough to "try a little massage" upon those unrelieved by more "orthodox" remedies. More and more is physical treatment being invoked in the earlier stages of illness or after recent injury: more and more is its general usefulness gaining recognition. Reasoned justification of this more general faith that is gradually being placed in "massage"—and in all that the term implies—must not be lacking; it can be supplied effectively only by those who are convinced and taught by practice. To such I specially appeal to investigate some of the fresh paths which I have now tried to indicate. These particularly are the chapters on "The Re-education of Muscle," "The Combination of Massage and Splintage in Orthopædic Surgery," and "The Re-education of Amputation Cases." Some passages, again, have been added in the hope that, in them, any medical readers I may have will

## Preface to the Second Edition.

find confirmation of the view that so far from massage constituting physical treatment it is no more than an auxiliary. This is set forth in the chapters already enumerated, and also in those dealing with "Massage in Obstetrics and Gynaecology," the treatment of "Sacro-iliac Strain," and the chapter on "Forced Movement."

For their unstinted help in the preparation of this edition I have again to thank several of those who had previously earned my gratitude. Miss J. H. Wicksteed has laboured indefatigably; Miss M. Randall too has helped me much, and the proof-reading has been in the same able hands as before. Mr. George Bethell has again, I am glad to say, been responsible for the Index. I owe several new illustrations and the second Appendix to the kindness of Miss F. Simpson, who until recently has had charge of the elementary class-work at Shepherd's Bush. Her services in this branch of the Massage Department have been invaluable. Figs. 154 to 157 inclusive were kindly provided by Captain James Patterson, of Vancouver. The remainder of the new illustrations were taken for me in the Shepherd's Bush Hospital, with the kind permission of the Medical Superintendent, Major Picton Phillips. All were specially taken, with the exception of Fig. 166, which was lent to me from the photographic records of the hospital.

## PREFACE TO THE FIRST EDITION.

THIS book is not intended to serve as a Text-book for the massage student. For such many books are already on the market, and there is no need to add to their number. Moreover, it will be recognised by the experienced masseur that many of the views herein expressed are unorthodox and are therefore dangerous diet for one whose main object in the immediate future is to satisfy examiners.

I have undertaken the heavy task of writing a book in wartime, at the request of my publishers, with two main objects in view. The first is to try to point out, as far as I can, to the practising masseurs and masseuses, what I consider to be the *rationale* of massage treatment, and to endeavour to introduce into their technique more generally than is at present the case the care and gentleness which appear to me as the key to the riddle of the exact nature of the massage which will most speedily yield a successful result. The six months' training at present in vogue is totally inadequate for efficiency or thorough teaching. My aim is to supplement both as far as can be done by the study of a book.

The second object I had in mind—which, I fear, is less likely to be realised—was that I might be able to place in the hands of my professional brethren a book to which they can refer when issuing instructions to their masseurs. A medical man who fails to issue adequate instructions may often be responsible for the failure for which his masseur is blamed. Another fertile source of disappointment is found in the lack of experience inseparable from a course of training limited to six months.

When a medical man orders massage he should not try to hand over his responsibility to the masseur. He should consider the prescription of massage treatment in the same light as he would consider that of a potent drug and watch its effects no less closely, varying the dose and the nature of the dose

## Preface to the First Edition.

from time to time according to indications. If he leaves the details of the prescription to the masseur, he can only expect to encounter the effect of an overdose with considerable frequency, and, less often, fail to note the improvement anticipated owing to insufficiency of dosage. But if he is to prescribe and intelligently to watch the effect of his prescription, it is essential that he should render his instructions intelligible to his masseur, should know what effect he hopes to see and of what danger signals he must beware.

Much of the success which is attending orthopædic surgery in its applications to the necessities of our wounded could not be attained without the concomitant of massage. Manipulation and exercises must often precede, should frequently accompany, and must almost invariably follow effective work by the surgeon. Without them his task in many cases would be either impossible or futile.

Massage is a dual agency, of prime value in either aspect. It may disclose (and aggravate, if we are not careful) latent mischief, as well as alleviate the danger which is apparent ; and it can expedite, confirm, and finally give effect to the amelioration made possible by surgery. In either case the primary reason is the fact that massage can be made to originate passive movement, movement not simulated, though it may be unconscious, nor even, perhaps, the result of the patient's volition, though executed by him. At times we must gain our ends, as it were, by stealth. If movement of this kind be the first objective, the method by which it is to be induced can have little in common with the strenuous procedure in which alone some masseurs still indulge. For the present purpose, at any rate, no great aid would be expected of such an auxiliary. Methods may bear small resemblance to one another save in name ; and I have endeavoured to point out the vast difference that exists between what I have called " relaxed " and all other forms of mobilisation.

Whether massage, manipulation, and mobilisation are to be for or against us to-day, when we cannot afford to ignore them, is a question first of principle and then of method. I have therefore endeavoured to set forth both how and why the various kinds and degrees of each—as a persuasive, and rarely

## Preface to the First Edition.

as a coercive, agency—should be severally applied. One thing I have felt we have long needed, namely, a considered study of principles such as underlie treatment by relaxation as well as that by contraction. The foundation of success in the restoration of function after disease or injury is the appreciation of the nature of true passive movement, and the skilful gradation to active movement, which must be successively partial, universal, and simultaneous. The prescribed processes and exercises, to justify their performance, so draw out or educate the degenerate but dormant abilities of injured muscles and tissues as to enable them to complete the recuperative course by their revived power of spontaneous action.

One word is necessary on the subject of the "exercises" so constantly referred to in the text. Certain exercises are described in detail. It must not be supposed, however, that this is done with the least idea that these can in any way replace or supplant the system of exercises we know as "Swedish." For all time these must remain as a pattern and guide. Whenever reference is made to exercises, the additional word "Swedish" should therefore be understood. The exercises described in detail, and which are not to be found in any Swedish table, are recorded only on this account. I have found them of service as an auxiliary to Swedish exercises; my hope is that others will share my experience. Moreover, treatment by Swedish exercises requires trained teachers, of whom, in the present emergency, the supply is inadequate. Some substitute has to be found, and I have tried to suggest one.

The final stage of convalescence may be long and tedious, perhaps a year's or two years' journey. The problem of the treatment to be given in such cases, and of its administration, has to be faced and solved, if men who have suffered in the nation's cause are not to lose the chance of regaining the greatest measure of physical ability that still is possible to them. It is one of the many questions which will demand solution and will get it, but not without much thought and labour.

The list of those who have helped me to prepare this book is a long one.

## Preface to the First Edition

To Sir Robert Jones I am indebted for the valuable opportunity of working for him at the Special Military Surgical Hospital, Shepherd's Bush ; and he has now added to his many kindnesses that of writing the Introduction which follows.

Miss Randell, Sister in charge of the Massage Department at St. Thomas' Hospital, has laboured indefatigably with my manuscript from beginning to end, and her help and advice have been most valuable. Miss J. H. Wicksteed, my Head Masseuse at the Shepherd's Bush Hospital, has done the same, and has also spared many hours of her small leisure to aid me in preparing the illustrations.

These I owe to the admirable skill, care, and patience of Mr. F. Howard Lewis, Photographer of the Military Orthopædic Hospital. Most of the photographs were taken in this hospital by kind permission of the then officer in command, Major J. J. Jenkins. All but seven are original. Five of these are illustrations of the use of slings, borrowed from my former book, *The Treatment of Fractures by Mobilisation and Massage*, the sixth I have modified from Sir Robert Jones, while the seventh, Fig. 75, is the photograph of a patient under the care of Major Bristow, which he has published in his recent *Treatment of Joint and Muscle Injuries*.

The thankless and laborious task of correcting proofs has most kindly been undertaken by Mr. H. C. Streatfeild, C.I.E., his wife and daughter, the two latter being most valued members of my staff at the Orthopædic Hospital. My readers, no less than myself, owe them a debt of gratitude. Other members of this staff who have helped me are Miss G. D. Innocent and Miss J. Milne.

My relief was great when Mr. George Bethell, Registrar of the Medical Society of London, kindly undertook to prepare the Index, without which any value the book may have would be very materially less.

J. B. M.

LONDON, W.

# INTRODUCTION TO THE FIRST EDITION.

BY

SIR ROBERT JONES, K.B.E., C.B., MAJ.-GEN. A.M.S.  
*Director of Special Military Surgery.*

THE value of massage as an aid to the orthopædic treatment of our wounded is now too well established to require defence. It cannot, however, be denied that many of the ideas prevalent as to the methods of its use are often very vague, and surgeons who have made a close enough study of the subject to give definite directions to the masseuse are still fewer than they should be.

In these pages we have an exposition of his own observations and practice by a physician, an acknowledged master, whose enthusiasm for his subject is tempered by a wide clinical experience of success and of failure.

It cannot be too frequently stated that treatment by massage must be directed and controlled by the surgeon treating the case. There is no half-way house between success and failure : massage either does good, or it does harm. The harm done may not be to the local injury from which the patient is suffering, but to his psychological attitude towards his own case. In hospitals which I visit it is common to meet patients who say they have had months of massage and are no better. There could be no stronger condemnation of the system by which the massage is controlled.

We still frequently find that cases are sent to the massage department with no detailed account of what has been done by the surgeon, of the plan by which he has been trying to restore function to a disabled limb, or of the part he wishes massage to play in the future course of his treatment. The respon-

## Introduction to the First Edition.

sibility rests on the surgeon, not on the masseuse. Success in treatment depends on loyalty between surgeon and masseur or masseuse: loyalty on the part of the surgeon in giving precise explanations of what he wishes, loyalty on the part of the masseuse in faithfully carrying out those instructions and immediately reporting any condition which she may observe.

When this close alliance is maintained, massage may be successfully employed as a preliminary to, as a concomitant with, and as a sequel to active surgical treatment. As a preliminary to surgical treatment, it may be of diagnostic value when the surgeon wishes to perform some operation, but the cicatrices from previous suppuration are an impediment to a successful operation. He may ask the masseuse to loosen the scars by delicate manipulation, but must warn her that the least sign of inflammatory reaction must be reported, for nothing except forced movement will arouse the activity of a latent focus of inflammatory mischief more quickly than massage. A preliminary course of massage will therefore serve to indicate whether the case is ready for surgical interference or not. It also prepares the way for operation and may even render it possible.

As a concomitant to surgical treatment, massage may be employed to alleviate pain, reduce oedema, assist circulation, and promote the nutrition of tissues.

As a sequel to operative treatment, it serves to restore the nutrition of tissues, and initiate the patient into an appreciation of muscle sense and movement lost by months of disuse following a severe septic injury, thus paving the way to recovery of voluntary muscle action, which is the ultimate aim of all orthopædic treatment.

In the following pages the constant reference to the use of "exercises" should serve to emphasise that massage should rarely constitute the whole of the treatment. Exercises should almost invariably find some place, and their skilful prescription is an art which calls for long, careful, and special study.

The responsibility of the masseuse to the surgeon must be based on a proper instruction in the idea or plan of treatment he is following. The masseuse must be technically well trained in manipulation, must have a sense of loyalty to the plan she

## Introduction to the First Edition.

is asked to follow, but must also have an intuitive sympathy with the patient, quick to appreciate when her manipulation is causing pain and may be harmful, quick to detect signs of inflammatory reaction and at once to report them, and most of all, quick to detect signs of recovery and to point them out to the patient, thus rousing in him an interest in his own progress, which is half the battle, for the psychological element must be kept in view. Without this last gift of intuitive sympathy the most perfect technical knowledge is useless. The convalescence also may be long and tedious, but in the pages which follow the reasons for perseverance are amply illustrated.

ROBERT JONES.



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# MASSAGE

## ITS PRINCIPLES AND PRACTICE.

### CHAPTER I.

#### A PERSONAL NOTE.

I HAVE said in my preface that many of the views expressed in these pages will be unorthodox, and my first attempt is to place on record the "reasons for the faith that is in me." This record is based on twelve years' experience of massage and its allied arts, and during that time I have watched the effects of treatment in upwards of six thousand cases of recent fracture alone. The unorthodoxy, where it exists, has therefore been put to a fair test, and, judged by results, its value is readily demonstrated. I hope that I may be forgiven a few personal words in explanation of the origin and growth of my faith.

I owe my first and, as it were, involuntary attempts at massage to the House-Surgeon to Out-patients under whom I first began my clinical experiences as a student. He was discontented with what in his own student days he had seen of the treatment of Colles' fractures ; and having heard in the course of his studentship that the after-stiffness of this accident could be prevented to a large extent by so-called "early movement," he proceeded to carry out this theory with more zeal than consideration for the feelings of his patients. Working under his instructions I noted that the patients kept their eyes glued to the injured part and that their preparations for resistance usually commenced long before the movement was attempted. I thought I might do better by placing one hand over the site of fracture, using it as a sort of wristlet for support. Finding my patients still seemed to see each attempt at movement and

## Massage.

to resist it accordingly, I next tried passing my hand up and down—not with any idea of rubbing the part, but merely to effect a distraction. Great was my surprise to be greeted by : “ Oh, Doctor, that is lovely ; do go on.” I went on, and I soon discovered that the amount of movement that I had previously attained by the exercise of considerable force, and at the expense of much pain to the patient, was now procured painlessly and without any attempt at force. I watched these cases closely, and soon saw that they improved in what appeared to me then an almost miraculous manner, compared with those who were treated by forced movement, let alone those who were subjected to prolonged splintage.

On receiving my first house appointment I decided to experiment further, and, encouraged by results, successfully extended the treatment to other fractures and injuries. It was at this point that, owing to the kindness of the then Resident Assistant Surgeon at St. Thomas', Mr. J. E. Adams, I was able to make the first tentative trial of instituting a regular clinic for the treatment of out-patients who had sustained fractures. At the end of six months I went to Paris and there commenced my close friendship with the late Just Lucas-Championnière. Though I never saw him treat a patient, I became his ardent disciple ; and on my return home I resumed my work with increased zest, when the late Mr. H. H. Clutton kindly assisted me by arranging that I should have full scope for my investigations, and by securing for me the post of Clinical Assistant in the Physical Exercise Department, an appointment thus created for the first time. I now had the opportunity for studying the methods of treatment applied to conditions other than those of recent injury, and formed the opinion that there were two distinct processes in massage : one applicable to recent injury and the other to all cases not coming under this head.

The first thing that made me doubt the integrity of this opinion was a story told me by Championnière, when, on a subsequent visit, I placed my theory before him. There was a masseur in Paris whose name was anathema to the medical world, though the general public formed a different view. His income was the envy of many of the leading medical men of Paris, but his methods he would not divulge. Then his son fell

## A Personal Note.

ill—I believe the illness was general peritonitis—and my old friend was consulted. He operated, and devoted himself to the case, which finally resulted in recovery. In gratitude, the masseur for the first time told a medical man the secret of his success. It may be stated in a word: “I never hurt a patient!” That was all, but it started a new line of thought. Since then I have had opportunities of watching various workers—English, French, Swedish, Italian, Danish—and have tried to select all that I saw good, and discard what seemed to be bad, in their methods. The result has been that I sometimes feel that I am rather in the position of a certain lady whose views have been recorded by Walsham How. A minister went to remonstrate with her on the fact that she had forsaken all orthodox forms of worship, and held a service every Sunday for her gardener, James, and herself. He thought, apparently, that the matter could be settled easily by asking whether the old lady really thought that she and James were the only two people who would be saved. He was somewhat taken aback by the answer “Well, I am not so sure about James.” Be that as it may, the views expressed in these pages are founded on the result of several years of close observation, study, and experiment. It is possible some of my deductions are erroneous, but at least they are capable of being argued and are not merely arbitrary. The slow but increasing acceptation of many of the principles enunciated now lead me to hope that I may have been able to add something to the advancement of the science of physico-therapeutics.

My hope is that the following pages may be regarded as the outcome of the actual experience of a medical man who has really studied massage, its theory and practice—a being all too rare at the present time. I trust that the record of this experience may help my medical colleagues to understand and to interest themselves in the work of their masseurs,<sup>1</sup> besides helping the latter to appreciate more fully the medical man’s point of view in connection with the work they are doing for him.

<sup>1</sup> Throughout this book the word “masseur” should be regarded as a generic term to include masseur, masseuse, and medical gymnast.

## CHAPTER II.

### GENERAL PRINCIPLES OF MASSAGE TREATMENT.

#### I.—THE REFLEX EFFECT OF MASSAGE.

To use massage aright we must consider it entirely as a means to an end, the end being restoration of function. Every movement performed should have this end in view ; and the masseur should be able to show, in reasoned detail, what effect it is hoped will result from each movement of hand or finger, and what part this effect is expected to play in the restoration of function. More than this, there should be a reason for every attitude assumed by the masseur, and for the position in which the part under treatment is placed—which joints are flexed or extended, which muscles are kept in tension and which relaxed. Thus in treating an arm it may be wiser to treat one patient sitting up, another standing, and a third lying down. For the treatment of the leg one patient should be recumbent, another prone, and a third sitting. Attention to details of this kind may make all the difference between success and failure, and so it is absolutely necessary that we should regard them as essential, and be prepared to support by reasoning and argument every detail of our treatment however apparently insignificant.

Massage being then merely the means to an end, we must first consider what effects we may expect from the exercise of these means.

There are two, and only two, possible effects of any movement of massage :—*reflex* and *mechanical*.

#### *Reflex Action of Massage.*

A. IN MASSAGE OF THE LIMBS.—It is still possible to find those who are inclined to scoff when the “reflex action of massage” is mentioned. It is, none the less, as important as

## General Principles of Massage Treatment.

the mechanical effect. The desire for massage is instinctive, and several points in massage treatment may be learnt from the most simple of nature studies.

A dog whose leg is run over seeks some quiet spot, lies down, and begins to lick the injured leg with a slow, gentle, rhythmical movement which is perfect because it is natural, and which should serve as a pattern to all masseurs. Nature prompts the animal thus to treat his injured limb—his treatment is not necessarily applied to a wound, as it is the same whether the skin be broken or not—and when we see that the slow, gentle, rhythmical massage brings him ease and comfort and at the same time hastens his recovery, surely we should copy as best we may and apply treatment that corresponds to it closely to our injured fellow men. Again, when we sit down after a heavy day of mental effort, perhaps the most common action is for the hand to be passed lightly and gently over the tired eyes and forehead, instinct teaching us that this movement will bring a sense of relief. Surely then, again, similar treatment is indicated for those who suffer from the chronic fatigue of neurasthenia. We know from nature and from our own experience that this stroking massage is capable of yielding comfort, and yet it is so light that its effect cannot conceivably be due to mechanical causes: the only possible way, therefore, in which it can act is by nerve reflex. Moreover, we all recognise certain reflexes which result from skin stimulation—the abdominal, plantar, and cremasteric reflexes. We also recognise the involuntary emptying of the stomach on tickling the back of the throat, and, almost the converse, the relief of hiccough that can be secured by tickling the anterior nares. It is only reasonable to suppose that, if one form of surface stimulation can produce a muscular contraction by reflex, another form of stimulation can secure relaxation.

In every-day life we recognise the beneficent effect of massage every time that we rub our eyes hard to reduce intra-ocular tension, or press upon temple or forehead after a day of great fatigue, when the blood pressure is high, in order to secure the relief that follows local reduction of blood pressure, even though the general pressure is not altered. It is thus that we instinctively invoke the aid of massage for its mechanical effect.

## Massage.

Passing from argument to fact, those who have once seen the treatment first devised by Lucas-Championnière applied to a recent fracture cannot but admit that they have witnessed the result of a profound reflex. A patient may have suffered severe comminution of the neck of the humerus. Before treatment he is in obvious agony, and on inspection the injured arm is visibly shorter and thicker than its fellow. Under the influence of massage the pain passes off, and then the arm slowly becomes longer and thinner under our touch, till finally it may be difficult to note the difference between the two limbs. In the same way, it is often possible to overcome the spasm which causes the shortening and deformity due to muscular spasm after fracture of the femur—a shortening it may be almost impossible to correct even when aided by anæsthesia. By massage we can relieve the spasm, even if we cannot always reduce the deformity.

The most noticeable result when massage is applied to a limb which has sustained a recent fracture is the transient nature of the subsequent swelling. This is often attributed to the mechanical effect of the massage, and yet the swelling may subside with equal rapidity whether the stroking is performed centrifugally or centripetally. In the former case mechanical action is inconceivable. If, however, we are only seeking a reflex effect, it is clearly immaterial whether our stroking is performed upwards or downwards.

**B. IN MASSAGE FOR DISEASES OF THE NERVOUS SYSTEM.—**  
In the treatment of an irritable neurasthenic, the victim of insomnia, if we watch the nervous irritable twitching slowly pass off as we proceed, see the anxious facial expression change to one of repose, and finally hear the regular deep breathing of a sleep, which is so sound that we can adjust the bed-clothes, wash, dress, turn out the light, open and shut the door, all without disturbing the sleeper, we can feel no possible doubt as to the reflex action of the massage we have given. Sometimes it is taught that the effect is due to relief of “congestion in the head.” The patient with arterio-sclerosis and high blood-pressure, who sleeps badly, may owe his trouble to “conges-

## General Principles of Massage Treatment.

tion," but the typical victim of insomnia has a low blood-pressure, and intra-cranial congestion is almost inconceivable. Moreover, many patients become drowsy before the head or neck are touched ; and, when they are treated, the touch is far too gentle to secure any mechanical effect whatsoever. Further, if massage, of the type that aims at securing mechanical effect, is administered to the neurasthenic with firmness and vigour, the result is often disastrous. This point will be further elucidated (see Chapter XXI.).

A medical man practising massage in the United States wrote to tell me that he even made use of the reflex action of massage as a means of confirming diagnosis. Thus, if a patient were the subject of persistent headache or neuralgia, he relied on massage to show whether or no the patient should be subjected to operation. He appears to believe that, if the pain can be relieved by massage, all idea of organic disease can be dismissed ; if the pain is not relieved, its persistence is in itself sufficient evidence of organic trouble to justify operation. This claim would seem to be extravagant, but it is none the less worthy of record, as showing how profound is the faith in the reflex action of his massage on the part of a competent, if enthusiastic, worker. Incidentally it should encourage us to hold out massage as a hope of relief to those sufferers from facial neuralgia and headache who owe their affliction to no cause that can be discovered. Assuredly the amount of relief that can be given is often great. It is particularly effective if the pain is due to fatigue, provided, of course, that the massage movement selected is suitable. Otherwise failure is certain, and it is possible that the trouble may be greatly aggravated (see Chapters XXI. and XXIV.).

C. IN ABDOMINAL MASSAGE.—If the abdomen of a pithed frog is opened, the lightest tap on the exposed bowel is capable of producing a dual effect. The portion of gut tapped passes instantly into spasm, and cardiac inhibition takes place simultaneously—surely a deleterious reflex. This reflex inhibition should always be kept in mind while performing abdominal massage.

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Yet abdominal massage, as taught and performed in many schools, would appear to have only a mechanical effect in view, so heavy are the movements and so great the pressure exerted. Why students should be left with the impression that treatment of the abdomen should entail the expenditure of much force is not quite clear, but so it is. The root of the evil may lie in the hurry that is inseparable from the attempt to accomplish too much in a limited time, or in a lack of comprehension of what it is that they wish to attain. If we regard our massage merely as a means to an end and consider how we wish to achieve that end, we shall rarely indeed apply heavy massage to the abdomen. Much has been written concerning the effect of abdominal massage on the activity of the glands which produce the various digestive juices, and doubtless this has had its effect on technique. Kleen, after an exhaustive summary, expresses his conclusions thus : "On the whole the most experienced experimenters have formed the opinion that mechanical stimulation does not produce, or at least is a long way behind chemical stimulation in producing, secretion of active digestive juices." <sup>1</sup>

It is possible that by mechanical means we can help empty a dilated stomach, and we can certainly assist in the softening and moulding of scybala, in those very exceptional cases where they are palpable, and therefore amenable to manipulation. In this event we can also assist their passage along the bowel.

The undilated stomach is completely hidden by the ribs, except for a minute area below the ensiform cartilage, and the only portions of the bowel which lie in fixed relationship to the abdominal wall, and in which we can be certain of the direction of the passage of the contents at any given moment, are the duodenum, the ascending and descending portions of the colon, and the iliac colon. In the transverse colon we know that the passage is from right to left; but we can never be certain of its position unless some pathological sign provides an indication. How is it possible then that we can hope to effect very much by massage of the abdomen unless it is by reflex effect?

Anyone, who has examined the abdomen of a patient who is suffering from sub-acute obstruction, must have been struck

<sup>1</sup> See Kleen's *Massage*, p. 58. Translated by Dr. Mina Dobbie. All further references to Kleen's work are taken from this book.

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with the readiness with which a portion of the bowel will pass into spasm under the hand, in response to the gentlest of taps or the lightest of palpation. It is thus that we are able sometimes to assist in forming a diagnosis when, in response to the slightest stimulation, we witness the sign of visible peristalsis. Here then we have direct evidence of the reflex contraction of the unstriped muscle of the bowel in response to mechanical stimulation, and we see also one way in which we can assist the propulsion of the fluid contents of the bowel, *viz.*, by stimulating peristalsis.

On the other hand, let those who hope to attain the same end by mechanical means witness the early stages of an operation for gastro-enterostomy. The surgeon draws up a portion of the jejunum, and, with the bowel actually in his hands, it is often a matter of difficulty to arrange for the passage of its contents so that he may have an empty piece of bowel on which to work. How much greater then must be the difficulty, if we can only handle that piece of bowel imperfectly through the abdominal wall ! Moreover, if a patient is placed in the Trendelenburg position, the whole of the bowel (in response to the force exerted by gravity) flows into the upper part of the abdomen as if it were a fluid mass, save for the duodenum, the fixed portions of the colon, and the rectum. Surely then any pressure we may exert through the abdominal parietes will have a corresponding effect. The actual portion of bowel touched by the indented abdominal wall will contract before gliding away from the part pressed upon. How then can we by our massage exert a mechanical influence upon any given portion of the bowel if it is free to move ? And, were we able to do so, how can we tell in what direction we wish to exert this influence, unless we are dealing with those very limited portions of bowel which remain permanently in a fixed position ? In the other parts may we not be forcing the contents "against the stream" while endeavouring to assist ?

It will be seen, then, that during general abdominal massage we must rely in the main on the reflex response to mechanical stimulation of the unstriped muscle if we wish to hasten the onflow of the contents of the bowel. But there are other ways in which we can secure reflex response to stimulation, on the

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part of the hollow viscera at least. Thus certain stimulation of the skin over the abdomen can be shown to originate peristaltic movement in the stomach ; while stimulation of the skin round the spine of the fifth thoracic vertebra causes the pyloric sphincter to relax. It is probable that similar stimulation round the seventh cervical spine has the opposite effect, and doubtless each portion of the bowel can be directly influenced by skin reflex. The only other instance of reflex response which has, I believe, been definitely proved is the reflex contraction of the muscle in the rectum in response to sacral beating and to hacking over the left sciatic nerve where it emerges from the cover of the great sacro-sciatic notch. The whole of this subject, however, calls for definite investigation and research.

It is possible that other abdominal organs can be influenced by reflex, *e.g.*, the unstriped muscle of the spleen may contract in response to mechanical stimulation transmitted from the ribs, or applied to the organ itself if it is enlarged. The function of the muscular tissue in the organ being to contract and relax, there is no doubt that stimulation to activity may be beneficial, but the physiological explanation of the benefit would be involved.

Professor Wide, of Stockholm, has shown by means of a blood-count, before and after treatment, that the number of red corpuscles in the blood is increased by abdominal massage. This, together with the general toning up of the vascular system, must re-act indirectly on all the abdominal organs.

The direct effect of massage on kidneys and liver will be dealt with when considering the mechanical effect of massage (p. 25).

The uterus is the abdominal organ to which massage treatment is very frequently applied. The reflex response to mechanical stimulation of the unstriped uterine muscle is a well-known aid to parturition.

The use of massage for stimulation of the heart is recognised in surgery, and it is performed in emergency by the "abdominal route." Some surgeons advise that the hand should be inserted into the upper part of the abdominal cavity, and the heart then compressed between the diaphragm and the ribs. A more

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effective method of dealing with cardiac failure during operation is to incise the diaphragm, whenever this is possible from the surgical nature of the case, and to pass the hand into the thorax so that the heart can be grasped near the base of the ventricles. Reflex response by contraction to mechanical stimulation is thus more readily assured. The vigour with which the manipulation is usually performed would encourage the supposition that purely mechanical action was anticipated, namely, that of pumping the blood from the heart into the great vessels. It may be necessary to render this assistance, but the effect of the massage would probably be no less gratifying were the pressure sufficient merely to render a mechanical stimulus to the unstriped muscle. If it is possible to stimulate into activity a heart that has actually stopped beating, it must be possible in the case of a heart that is already beating to enhance its activity by mechanical stimulation. The danger of flogging an overtired horse must, however, be kept in mind.

I know but little from personal experience or investigation of the direct action of the ordinary movements of massage on the heart's action. It has been claimed that *tapotement* over the chest has the effect of lowering the rate of the heart-beat. This presumably is due to reflex action on the vagus. A general review of the literature available leads to the conviction that the claim is "not proven." Indeed the difficulty of investigation must of necessity leave a vastly "wide margin for error" in observation, as witness the experiments of Dr. Abrams (quoted by Graham), who found that "any (sharp) cutaneous stimulant . . . will produce a diminution in the size of the heart," and it is common knowledge how variable may be the pulse-rate of a patient with an "irritable" heart.

Whenever massage treatment is ordered it is necessary to take the age of the patient into consideration, and more particularly when we are aiming solely to secure a reflex action. The reflex arc in the child is highly sensitive, and the fullest effect is thus secured rapidly. In the aged it is possible to cause fatigue with equal rapidity, and treatment then produces an irritative effect. In the young, therefore, and in the aged the duration of massage treatment should be curtailed.

## CHAPTER III.

### GENERAL PRINCIPLES OF MASSAGE TREATMENT (*continued*).

#### 2.—THE MECHANICAL ACTION OF MASSAGE.

To obtain a mechanical action, a heavier pressure is called for than that which we use if pure reflex action is desired. It would seem that there are four possible ways in which our massage movements can exert a mechanical effect :—

- (i.) By assisting the circulation.
- (ii.) By aiding the movement of the lymph.
- (iii.) By tension on some structure which we hope to free or stretch.
- (iv.) By the effect of pressure on the abdominal viscera.

##### *(i.) The Mechanical Effect of Massage on the Circulation.*

There are only two ways in which massage can produce a mechanical effect on the circulation. It may assist the venous return, or it may so act on the walls of the arterioles as to maintain or restore the tone of the vaso-motor system.

We know the results of mechanical stimulation of the unstriped muscle within the abdomen, and, arguing from these results, it seems not unlikely that restoration of tone, through the mechanical effect of massage on the circulation, is really due to a reflex response to mechanical stimulation of the unstriped musculature of the arterial system.

Direct mechanical assistance to the arterial supply of a limb by massage has, so far as I know, never been advocated.<sup>1</sup>

If we desire to influence the vaso-motor mechanism, we can scarcely expect that purely mechanical agencies will effect our object, save in one or other of two distinct ways. By assisting the venous return we can lessen the *vis a fronte* in the arterioles,

<sup>1</sup> Recently I have seen centrifugal stroking of the femoral artery advocated for senile gangrene of the toes. The suggestion seemed so unworthy of consideration, and the argument so fallacious, that apparently I did not trouble to retain the article.

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and the blood can then pass through them more rapidly. Thus, presuming the blood-pressure to remain unaltered, a larger supply of blood will be required for the part under treatment, and the vaso-motor mechanism must be called into play to fulfil this want.

It is also possible to cause a dilatation of the arterioles by paralysing their muscle fibres, much in the same way that we can note a paralytic dilatation as the result of an ordinary bruise. The only differences are that the paralytic distension caused by massage is (or should be) very transient, while that due to bruising is far less so; and that after bruising there is a certain amount of actual extravasation of blood. The pathology is the same, and the healthy glow seen on the surface of the skin after percussion is due to paralytic dilatation of the skin vessels (*cf.* p. 56). To the healthy person the effect of heavy percussion after violent exercise or a Turkish bath is undoubtedly pleasing, but its therapeutic value seems to be problematical. Any form of massage, with the exception of surface stroking, may be performed with rapidity and vigour if we wish to impart a general "refreshing" sensation. This treatment should only be administered to those parts which are nearly or quite normal and healthy—never over muscles that are paralysed or in neurasthenia—and only for a very few moments at a time over any given spot. Otherwise fatigue, either local or general, is inevitable.

If it is desired to cause a local hyperæmia, as is often the case, it would seem easier and safer to attain our end by some other means than by the use of massage, such for instance as the hot bath—be it air or water—or by some form of Bier's congestive treatment. Massage should be used to improve the circulation through the part treated. Contrast bathing where a limb is held alternately in very hot and cold water, is an excellent device for providing what Robert Jones has described as "gymnastics for the arterioles."

If we decide, therefore, that we will cease all attempts intentionally to secure mechanical effect on the vaso-motor system,—to a certain extent it is unavoidable in some of our manipulations,—it only remains to consider how our massage is to assist the venous return, leaving any vaso-motor effect to be achieved

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either by the result of our action on the venous return, or in response to reflex stimulation of nerve or muscle.

To assist the venous return there is no call for the expenditure of any great effort : the lightest touch is all that is required to empty the superficial veins of arm or leg. There is little reason for supposing that the pressure in the deeper veins exceeds 5 to 10 mm. of mercury, while in most of them it is lower still, the pressure in the veins at the root of the neck being negative. It follows, therefore, that downward stroking over the veins of the neck, in the absence of back-pressure, can do little or nothing to relieve intra-cranial pressure by mechanical means. Yet this claim is often made. The advantage gained by increasing the downward suction must be problematical. The relief so frequently afforded by this movement can only be due to reflex action, and in practice we find that surface massage is at least no less effective than deep stroking in securing relief of the feeling of congestion.

Bearing in mind the effect of muscular contraction on the venous flow, it stands to reason that any attempt materially to assist the flow by massage is doomed to failure if the lumen of the vein has already been reduced to a minimum by muscular contraction around it. Thus our first law of treatment, if we are attempting to assist the venous flow, should be to ensure absolute relaxation of all muscles, not only in the part under treatment, but also throughout the various areas of the body which lie between the veins under treatment and the large veins in the region of the heart. If we are dealing with the veins of the leg, it is essential to see that all the thigh muscles are relaxed as well as those in the leg itself. Moreover, if the intra-abdominal pressure is raised by contraction of the abdominal muscles, there is a certain amount of obstruction to the flow of blood from the femoral vein into the external iliac vein ; and it is therefore impossible to attain the maximum benefit from our massage of the leg unless the abdominal muscles are relaxed as well as those of the thigh. The effect of gravity should also be kept in mind, and so we find that, if we wish to do everything in our power to assist the return of blood from the foot, it is not sufficient that the patient should be seated with abdominal muscles relaxed, but he should be recumbent with

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thighs supported in a slightly flexed position. In this position gravity no longer opposes the venous flow, there is no increase



FIG. 1.—To show contour of the muscles, the lower limb being at rest and supported. Note that the long axis of the "oval" formed is transverse.

of intra-abdominal tension due to muscular action, and the thigh muscles are relaxed.



FIG. 2.—The same as in Fig. 1, the limb being supported only at the heel. The long axis of the "oval" becomes vertical.

If we examine a limb in which the muscles are completely relaxed, we find that it closely resembles a rubber hot-water bottle filled with water rather more fully than is usually the

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case. Thus the shape of the leg if at rest and in the horizontal position on a bed is, roughly speaking, oval with the long



FIG. 3.—Contour with muscles contracted, the limb being supported only at the heel. The contour is more nearly circular than in Figs. 1 or 2.

diameter transverse. If the heel only is supported by an assistant and the muscles are kept at rest, the oval shape remains, but the long diameter becomes vertical. In either case,



FIG. 4.—Contour with limb in same position as in Fig. 3, but with the calf supported. Note that the pressure on the calf now causes little or no change in the general outline of the limb, as the muscles are contracted.

assuming the muscles to be normal, voluntary contraction renders the contour roughly circular (see Figs. 1 to 4). In other words, the muscles, when in a state of relaxation, respond within the skin to the same laws that would control the position of

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fluid in a bag ; while if they are contracted they assume a consistency which is almost impervious to external pressure. We see then that, having secured perfect relaxation of the muscles, a very slight degree of pressure is all that is required to press the blood out of the part in contact with the hand into the next proximal portion. This truth is further borne out if we remember that it is possible almost entirely to deplete a limb of its venous blood by simple elevation.

If, on the other hand, we exert a considerable pressure in our movements, we shall empty the veins equally efficiently ; but there are other blood-vessels to consider. The pressure in the arterioles is very low and in the smaller arteries not very much higher. By the application of any considerable amount of pressure in a centripetal direction, it is obvious that we shall be forcing the blood in these slender vessels *against* the direction of the flow ; and it is difficult to argue from the purely scientific point of view that any benefit could result. Indeed, it is not inconceivable that we may be doing actual harm ; we certainly cannot claim that by obstructing the flow of blood into the veins we are assisting the venous return, which is the main objective in our manipulations. The clinical effect of too heavy pressure is a blanching of the part under treatment. There is no reason to suppose that the vaso-constriction is confined to the skin-vessels ; it must be presumed to take place in the deeper structures as well. Sometimes it is followed by a flushing of the part, due to subsequent vaso-dilatation, which if prolonged is probably paralytic (*cf.* p. 56). Any one who has tested the blood-pressure in the brachial artery with an ordinary mercurial manometer will know how slight a grip of the bulb is required completely to obliterate the brachial pulse. It is true that in massage we do not apply our pressure to the whole circumference of the limb, and therefore we are not likely to attain a similar result by an equal pressure, but let us beware of doing so even in the smaller vessels.

### (ii.) *The Effect of Massage on the Lymphatics.*

All that has been said of massage as an agent to assist the vascular system applies no less strongly when we consider its application for the benefit of the lymphatic circulation. Any

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toning up of the vaso-motor system that we can compass, and any assistance that we can give to the venous return, must, of necessity, tend to prevent the formation of oedema, and thus decrease any tendency there may be to stagnation in the lymphatics.

The pressure of lymph in the lymphatics is very low, and the lightest pressure must be all that is required to assist the onflow of the lymph under normal conditions.

But once oedema is present we have a pathological condition to combat, and it is well to remember that it is often possible to reduce an intense oedema by simple elevation. This reduction is, of course, transitory.

The following question sometimes arises :—“ Why, if the process of emptying the lymphatic spaces is all that is required, should the result obtained by massage be more permanent than that of simple elevation ? ” The answer is simple. By elevation we can reduce the swelling, but we are doing nothing to remedy the cause of the swelling. By the use of massage we can assist the action of gravity very materially, and, at the same time, we can help to secure restoration of the tone of the vaso-motor system. The value of the scientific combination of elevation and rest, and of massage and activity in orthopædic cases is dealt with in Chapter XXXII.

Massage, however, can be invoked as a remedy calculated to secure the permanent relief of oedema, but it cannot do so if its effects are counteracted by neglect of reasonable postural treatment. It is also well to remember that oedema, as usually met with in cases recommended for massage treatment, is not due to disease of the lymphatic system, but is merely a symptom that “ something has gone wrong ” with the circulatory system.

Let us suppose that a rubber bottle filled completely by a sponge soaked in water is suspended by a string round its neck, and that we are asked to empty out the fluid content without disturbing the position of the bottle. The first thing we should do would be to take out the stopper and thus ensure there was no impediment to the outlet. Next we should place our hands on either side of the bottle near the top and squeeze out the water there ; on relaxing we should squeeze somewhat lower and empty out, as it were, the next layer, and so on. It would

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be obvious folly to try to achieve our task while the exit was blocked, and pressure from below (unless the bag were practically full of water) would only result in pushing the water from the bottom of the bag to the top, allowing it to drop back again as soon as our pressure was relaxed. The parallel between the sponge in a rubber bag and the lymphatic system is not exact, but will serve.

If we wish to reduce œdema in a portion of a limb, the obvious course is to make sure there is no obstruction to the flow of the lymph in the proximal part. Let us then commence our massage above the level of the œdema and work gradually down towards the extremity—emptying a proximal space, filling it from the next more distal space, emptying it again, and so on.

Let us suppose that a leg is œdematosus as high as the knee. Our first duty, as Wharton Hood has already expressed it, is to take the stopper out of the bottle by massage of the thigh. Then let us try to empty the contents of the lymphatics for, say, a hand's breadth below the knee into those above it, and we next ensure that the proximal channels are not overloaded by resuming massage of the thigh. Our next move is to restart massage of the leg another hand's breadth lower down. We empty this into the channels just below the knee, empty these in turn into the thigh, and once more see that these are not overloaded. In this way we can, by direct mechanical action, help to reduce œdema of the leg; but several days might elapse before our massage of the foot commenced. Were we to treat the foot before the leg had been fully prepared, the only result would be that the lymph in the foot would be squeezed into the already over-distended channels of the leg, where its onward passage would be impeded, with the inevitable result that it would return to the foot on the first opportunity.

In cases where the œdema is recent—however intense it may be—only a very gentle pressure need be exerted in our manipulations if the above plan of campaign is carried out faithfully. If the œdema is of long standing and of that tough, doughy consistency which the masseur so dreads to encounter, the exercise of a somewhat increased pressure may assist to clear the trouble more quickly, though our general plan should

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be adhered to in the main. A good working hypothesis which alone explains this need for greater pressure under these circumstances is as follows. The lymph, owing to long stagnation, has partially clotted, and has assumed a consistency more or less resembling treacle—just as happens in the synovial fluid of a knee-joint that has suffered from a long-standing synovitis. This thickened semi-solid lymph in the lymph spaces is too thick to pass through the minute stomata into the lymph channels. The heavier massage is required to break up the fine meshwork that has formed in the “clotted” lymph and to render it less “treacly.” It is possible that our pressure may have the effect of producing a temporary paralytic dilatation of the arterioles, which, by causing a further outpouring of lymph, helps to dilute the now “sticky” lymph already present to such an extent that it is once more able to pass through the stomata into the lymphatic channels. Needless to say, this is purely a theoretical speculation as to what takes place. If it is true, it is obvious that no great pressure is required to break up the minute and very fragile fibrils in the presumed “semi-clotted” lymph; while the ease with which a transitory paralytic dilatation of the vascular system can be secured is shown by the readiness with which we can produce a flushing of the skin from this cause in response to very mild stimulation. But, be the explanation what it may, it is certainly erroneous to suppose that severe pummelling of a limb is necessary for the reduction of oedema. Such treatment is, in fact, detrimental. For the oedema to be present at all there must be some disorganisation in the vaso-motor system, and a severe handling will inflict an injury which the deficient circulation is already inadequate to repair. The possibility of such injury is still more obvious when we remember that we may simultaneously be damaging the vascular system by forcing the blood along the smaller arteries against the direction of flow and at the same time—perhaps even by this very action—causing a prolonged paralytic dilatation of the arterioles.

That too vigorous massage applied to an oedematous limb may fail to secure the desired result, while less forceful technique is crowned with success, is shown in the following instance, which is only one amongst many. An officer had been receiving

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massage treatment for many weeks before he came under my care. He told me that at first he laughed at the idea that our gentle handling could help him, when his former vigorous treatment had failed to do so. In a week he changed his mind on finding the circumference of his ankle reduced by over half an inch from the size it had maintained uniformly for many weeks. He added that he thought I was crazy when I first ordered massage to begin on the thigh when his trouble was in his foot !

The advice here given is in no wise to be regarded as a cloak for laziness on the part of the masseur. He who sits down and chats casually to his patient or stares about him while giving the treatment is neglecting his duty. A very considerable degree of concentration is essential, if the treatment of œdema is to be successfully performed. True, it is the sense of touch that controls the movements, but the fine distinctions that must be drawn to detect variations in consistency during treatment call for skilled work and close attention. Indiscriminate kneading and friction is not enough. At the upper level of the œdema general kneading is all that is required; as the level of the œdema is reached the firmness of the kneading should be increased. When the œdematos area itself is first treated the proximal part can be dealt with efficiently more easily than the next, and so on. When the level at which friction is first called for is reached, it may be necessary to apply it to one spot only. A little further down a considerable area may need to be dealt with in this way. Friction, kneading, stroking alternate with each other in ceaseless change and variation, but the changes must not be made promiscuously. At some definite moment friction should cease and kneading begin. If this moment is disregarded, too little or too much is done. So, too, with each of the other movements. The frictions should be performed with a rapidity that is excessively tiring, particularly if the pressure is properly graduated. The kneading should be less so, but none the less definite conscious effort is called for if the best is to be got out of the movement. The deep stroking is the least fatiguing; but it should serve only as a period of relaxed concentration, which will enable the masseur to recover, as it were, from his recent combination of mental and physical

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strain and to prepare for further effort. The time that should be devoted to the stroking is rarely, if ever, too long for this, and at the end of half an hour's work on an oedematous limb the masseur should have had enough. He should not be "done in" by physical exhaustion, but by the combination of physical work and mental concentration.

### *(iii.) Mechanical Effect of Massage in Stretching Tissue.*

Putting aside for the moment the question of mechanical obstruction, there are two kinds of tissue, the result of pathological processes, which impede the restoration of function. These are white fibrous and yellow elastic connective tissue. Sometimes we are also called upon to stretch certain normal tissues which have become shortened owing to some pathological condition. The most common condition of this type is tendon-insufficiency.

With the bands of white fibrous connective tissue which require to be broken we have, or rather should have, little or nothing to do. They concern the surgeon only and should be broken down by him, preferably under an anaesthetic. But all adhesions do not partake of this nature: the yellow elastic adhesion can rarely be dealt with thus, and in massage treatment lies one chance of relief for the sufferer.

If we desire to make use of a spiral spring and it is a little too short for our purpose, the manner in which we should lengthen it is to pull the ends of our spring apart with a slow, steady traction and then relax almost equally slowly to see how far our effort has met with success. Exactly in this manner should we deal with our yellow elastic tissue or with any normal structure which we desire to lengthen, for all tissues within the body, except bone, are elastic. Spasmodic slight tugs at the end of our spring would not serve to lengthen it; sudden violent stress might tend to break it or so to modify its shape that it would be useless for our purpose. So with our elastic tissue, be it muscular, tendinous, or yellow fibrous. If we subject it to a series of spasmodic tugs, each tug will no doubt tend to lengthen it; but, being elastic, the recoil will undo at once any good that may have been achieved. If, on the other hand, our movement is so violent that we succeed in

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breaking the offending structure wholly or in part, we shall thereby set up a reaction of such severity that all attempt at movement in the immediate future will be seriously impeded. The only safe treatment after this accident is to rest the part till recovery has taken place, when we shall find that the impediment of function is as bad as, and possibly worse than, it was before. This is, of course, only part of the truth, and refers to such stretching as can be performed in the massage-room. The surgeon in the operating theatre and under an anæsthetic may be able to break down even elastic fibrous tissue, but then he enforces a period of rest in the corrected position, preferably by the use of plaster of Paris applied firmly over exceedingly thick padding, until the reaction has passed off. Failing this, he will probably retard his patient's recovery no less than would the masseur had he attempted similar treatment. In fact, he often does so; the whole question of "breaking down" is a matter of judgment, and error is unavoidable (see Chapter XVII.).

When a case is recommended for massage treatment and we find that our work is to stretch some impeding band or structure, we may then be sure that what is required is slow, steady tension or some other form of gradual stretching, and take it for granted that, had forcible tearing or breaking down been desired, it would have been performed by the surgeon. We have only to decide upon the best method at our disposal to attain the end in view, and this we shall see, when we consider the treatment of scars and contractures, is to loosen the structures throughout the neighbourhood of the lesion, subsequently placing a gradually increasing tension on the offending structures, while an attempt is made to add slowly to that tension by means of manipulation.

Seeing, then, that the slow, steady pull is our chief remedial agent, it is evident that the longer this pull is exerted the greater will be the effect. The possibilities of splintage now become evident. This much is certain: in suitable cases splintage will effect more stretching in a week than massage and manipulation can do in a month. It is also safer, being easily amenable to adjustment and comparatively free from the danger of excess.

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In many cases of failure to effect a cure by massage, the true explanation lies in the fact that it has been asked to perform an impossible task. Where this is so there is a very grave danger that, legitimate treatment having failed—as fail it must—less legitimate methods may be attempted. Irremediable injury may be caused, and, in addition, massage has been abused.

### *(iv.) The Mechanical Effect of Massage on the Abdominal Viscera.*

The reflex effect of correct massage in stimulating the activity of unstriped muscle has already been considered, but it is also possible to secure a definite mechanical effect in the treatment of the viscera by massage.

It has been mentioned that the dilated stomach can be made to contract by reflex in response to stimulation, but it will be found that the contraction of the stretched and therefore weakened muscles may by itself be inadequate to empty the organ of its contents. The movement of these contents by mechanical methods, copying as far as may be the natural movement, undoubtedly assists their passage through the pylorus; though even here reflex action must still play its part, as all the mechanical persuasion which we can exert with our massage will not induce the sphincter to relax.

As we have already seen, attempts to secure the passage of its contents along the small bowel by mechanical means would seem to be doomed to failure. It is impossible for us to know the direction of the passage of the contents in any particular coil under our hand, and, for all we know, any pressure we may exert tends merely to force them “against the stream.”

In the large bowel, on the other hand, there is a possibility of our being able to afford valuable assistance, though the instances where we can do so must be comparatively few when compared with the many in which we can help by securing reflex contraction. None the less it is undoubtedly possible to assist to some extent the passage of the contents downwards in the descending colon and upwards in the cæcum and ascending colon. The transverse colon is not so easy to manipulate, as its position is so variable. In rare cases, however, it is possible to note the presence of scybala or gas, and then

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our assistance to their onward passage may be most valuable.

The most common use of mechanical means for assisting the passage of the contents of a hollow viscus is, of course, in securing expulsion of the placenta ; but this hardly comes within the scope of massage.

Massage is also employed for the treatment of the solid viscera, and even the pancreas has been mentioned in this respect. It is possible that this organ can be influenced reflexly, but it would seem probable that it is only by the indirect effect produced by improving the general vascular tone. We may also be able to excite it to activity as the result of the passage of the contents of the stomach, which, without our assistance, might have been delayed.

The effect of massage on the spleen has already been considered (p. 10).

Whether the action of the kidneys can be effected by massage is extremely problematical. During a cystoscopy, urine may be seen to pass from the mouth of the ureter into the bladder in response to kneading of the kidney. Whether this result can be made use of for clinical purposes is more than doubtful, as a prolonged pummelling—sufficient to lead to the elimination of an appreciable quantity of urine—would, it is easy to imagine, be attended by serious risk of inflicting damage on so delicate an organ. Changes in the amount and proportion of the solids excreted in the urine as the result of general massage, and particularly of abdominal massage, have been demonstrated by many observers.

Much the same may be said of treatment administered to the liver. There is a common idea that anything that "shakes up the liver" is beneficial. The massage usually administered as a routine part of a "general abdominal treatment" should certainly achieve this end ; but what the physiological result of this "shaking" may be it is not easy to judge. Certainly in the *post-mortem* room it is difficult to see in what respects "shaking up" would be beneficial, and examination of the liver cells under the microscope seems to increase the difficulty. The assistance given to the portal circulation by our general abdominal massage may, and indeed must, have some effect

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on the circulation within the liver ; and were it possible to knead the organ thoroughly we could doubtless aid the circulation within it still more. By assisting the circulation we can assist all the functions of the organ ; and not only so, but we can probably reduce the viscosity of the bile and so render its excretion more easy. But that this effect, or indeed any other beneficial result, can follow as a direct result of percussion of the ribs seems more than doubtful. If it is attainable it is probably due to reflex *via* the intercostal nerves and the sympathetic system.

I was particularly interested to read in Dobbie's translation of Kleen's *Massage* that " abdominal massage is an extremely valuable form of massage. It is, however, much less valuable for its effect upon the glands of the digestive apparatus and on the circulation than for its powerful influence upon the musculature of the alimentary canal."

The gall-bladder, being a hollow organ, is amenable to the mechanical effects of massage. The very shaking up of the bile within it may have a beneficial effect, and doubtless its muscular fibres—though none too numerous—can be toned up and exercised. It is possible to imagine that we could actually aid the passage of the bile past the spiral valve in the neck of the bladder by our manipulations.

Of the organs within the thorax the lungs are, of course, amenable to mechanical treatment, as in the compression that forms part of artificial respiration. Though this is outside the realm of massage proper, much benefit may be derived by rendering mechanical assistance to respiration. The effect of massage on the heart is probably not a mechanical effect at all, but merely reflex,—the response of unstriped muscle to mechanical stimulation if treatment is applied directly to the organ. Otherwise any effect of massage on the heart is by reflex through the central nervous system.

Massage is applied to the prostate for mechanical effect. By its means we endeavour to squeeze out undesirable *débris* in the ducts.

Massage of the ears can assist in allaying retraction of the drums.

## CHAPTER IV.

### THE MOVEMENTS OF MASSAGE.

#### I.—STROKING MOVEMENTS.

DESPITE the nomenclature that has been applied to the various movements of massage—*effrayante* Lucas-Championnière calls it—there are only three main varieties. These are :—

*Stroking Movements.*

*Compression Movements.*

*Percussion Movements.*

Each has countless subdivisions, all called by a different name ; and the classification by different authors is, unfortunately, not uniform. An attempt will now be made to reduce this classification to the simplest possible form, and to indicate the method of employment of each variety.

#### I.—STROKING MOVEMENTS.

This consists of the passage of the hand over a somewhat extended area of the patient's body. It has two varieties, superficial and deep.

(a) *Superficial Stroking Massage*.—Though it is possible to trace a reflex response to most of the movements of massage, this is the only movement which aims at securing no other effect.

The essentials to remember in using this treatment are that our movements must be slow, gentle, and rhythmical.

The slowness is important, as without it the other two essentials are impossible. If the stroke is to pass from hand to shoulder, some fifteen movements a minute will suffice. Moreover, the movement of the masseur's hand must throughout be continuous and even, not only while the hand is in contact with the part, but also during its return through the air, when there must be no contact. Occasionally we hear it stated that loss of contact between the hand and the part is conducive to

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a chilling of the patient. This can only be due to inefficient performance, when the movement may convey a "creepy" sensation. This is usually the outcome of timidity, or of lack of training and practice.

The call for gentleness is obvious, as we are avowedly attempting to secure no mechanical effect. The firmness of the pressure should be sufficient only to ensure that the patient is actually conscious of the passage of the hand throughout the entire movement. Thus there should be no question of the patient



FIG. 5.—Showing upward surface stroking of the lower extremity. In practice, in order to secure the fullest effect, the stroke should be continued up the thigh. Note that the "stroke" commences before the hand comes in contact with the limb, and also the slight flexion of the knee.

being able to detect the passage of the hand over a certain point during one movement while being unable to note it during subsequent movements. Otherwise the sensation conveyed by one movement cannot be identical with that conveyed by each subsequent movement. Firmness is essential, but only the lightest possible pressure.

The need for rhythm can be readily understood, as without it the nature of the stimulus will be uneven, and the reaction also will thereby be rendered uneven.

There should be no sensation of jarring at the beginning or

## The Movements of Massage.

end of the stroke, and the time that elapses between the end of one stroke and the commencement of the next must be identical throughout the whole of the treatment. To attain all these requisites it is essential to develop a "swing," and the portion of the "swing" which takes place with the hand out of contact with the limb is as important as that during which hand and skin are in contact. Throughout the treatment the masseur's hand must remain supple, with all muscles relaxed, so that it may mould itself naturally to the contour



FIG. 6.—Showing upward surface stroking of the lower extremity, the middle of the "stroke." Note how the hand is adapting itself to the contour of the limb. There is no fear of the patient noticing any "scratching" or tickling sensation.

of the limb, thus ensuring greater perfection of contact, and bringing as wide an area as possible under treatment (see Figs. 5, 6, 7).

The last point to consider is the direction of the stroke, when we are applying this form of massage to the limbs. Provided that the three essentials are carried out, this is a matter of minor importance. In his book on the treatment of fractures Lucas-Championnière inveighs heavily against the use of any stroking in a direction opposed to that of the venous flow. But the context proves that he had in mind the so-called

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massage which is meted out after a Turkish bath, and surely it is impossible to imagine anything more devoid of scientific excuse than any form of heavy stroking against the venous return. But we are speaking now of the massage of skilled workers employed in the treatment of injury or disease, and of a movement which the French master referred to as "little more than a caress." If we wish to secure nothing but a reflex response to our movement, it may safely be left to the



FIG. 7.—Showing upward surface stroking of the lower extremity, the finish of the "stroke" just before contact between hand and skin ceases. Although reference is made to the "commencement" and the "finish" of the "stroke," it must be clearly understood that the "finish" represents equally well the "commencement" of the return of the hand through the air. As the movement is continuous, there can be no "beginning" or "end."

patient to decide the direction. If movement in one direction is more pleasing than another, there can be no objection to using it, even though the movement be centrifugal. Surface stroking "against the grain" of a hairy limb may be devoid of comfort, and, if so, it cannot be expected to call forth a beneficent reflex. It can only annoy. Shaving the part might be expected to help: it does not, and the process is not recommended save in the rarest of cases.

But whatever may be the direction chosen, one rule must be

## The Movements of Massage.

strictly adhered to, namely, that the stroking is performed in the one direction only. Thus, if we are stroking the back of a patient suffering from insomnia, our stroke should be from cervical or thoracic region downwards, or to the cervical or thoracic region upwards, never from sacrum to thoracic region and then out over the shoulder with a downward tendency at the end. In the same way, if a leg is being stroked upwards, the utmost care must be taken not to allow the hand to come into contact with any part of the limb during the return ; otherwise the stimulus will be broken and the reaction thereby rendered imperfect.

Some people seem to be totally unable to learn the art of surface stroking. It is the simplest, but apparently the most difficult, of all the movements of massage. The discomfort to the patient of inefficient stroking must be experienced to be believed. The most common mistake is to scratch the patient with the pads of the fingers towards the end of each stroke. A second common error is to ignore the necessity for controlling the return of the hand through the air, and so to make this part of the movement less rhythmical than the stroking itself. A third main fault in technique is to ignore the necessity of selecting one definite direction for the movement, and, once having made the selection, of abiding thereby. One point is often overlooked. Not only the hand, but every joint in the limb must be perfectly relaxed and perfectly supple.

It is often possible to secure reflex action in deep-seated structures as the result of superficial stroking, such as contraction of the stomach due to stimulating the left lower intercostal nerves, and stimulation of the rectum by stroking over the gluteal area. These will be dealt with subsequently, each in its separate place.

(b) *Deep Stroking Massage*.—This is usually referred to as *effleurage*. Unfortunately some writers regard *effleurage* as essentially a superficial movement. If the movement is performed over muscles which are held contracted, doubtless this is the case. But if the musculature is relaxed throughout the treatment, as here advocated, even a light pressure must influence every structure throughout the part treated (*cf. p. 14*). *Effleurage* should always be performed centripetally, as is the

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case with all "deep" movements. Although the movement is here described as "deep," it must be emphasised, even *ad nauseam*, that the depth of the movement depends solely on the presence of relaxation of the musculature throughout the part. Thus the movement may be "deep" without in any



FIG. 8.—Upward stroking of the lower extremity to illustrate some common faults in position:—

(A) *Of the patient.*

- (i.) General discomfort, head unsupported, abdominal muscles contracted.
- (ii.) Knee fully extended, thigh muscles tense.
- (iii.) Foot unsupported.

(B) *Of the masseur.*

- (i.) General discomfort, great strain on back muscles, and on knees.
- (ii.) Inability to reach whole of limb.
- (iii.) Inability to render support to limb.
- (iv.) Regularity of movement or pressure quite uncontrolled.

sense of the word being "forcible"; and, as applied to the manipulations of massage, the terms are not synonymous, though the practice of many masseurs would lead one to suppose that they were so. The movement is intended to assist the restoration or maintenance of the tone of the vaso-motor system, to assist the venous flow and the circulation of the lymph, and, incidentally, thereby to improve the vascu-

## The Movements of Massage.

larity of the part and to hasten the elimination of waste products. It may be used to quicken mechanically the movements of the contents of some hollow viscus, or to secure some reflex response, such as an increase in peristaltic movement.

The resistance offered by muscular contraction to deep stroking is so great as to render it practically useless. As the first essential is to ensure that the whole part under treatment is in a state of perfect relaxation, careful attention must be given to the posture not only of the part under treatment but of the patient's whole body. If necessary, relaxation must be procured by preliminary superficial stroking. If the muscles are relaxed, they offer no more resistance to the movement than so much fluid, and therefore it is obvious that any pressure, exerted on the surface, will be transmitted freely to all the structures under the hand. To attain any of the objects in view in using the movement, except perhaps the mechanical emptying of a dilated stomach, a pressure of 10 mm. of mercury will suffice. A little practice, combined with a skill that is born only of a sensitive sense of touch, will show how delicate may be the pressure which will suffice to compress any structure to its full extent, and therefore, incidentally, to empty the veins and lymphatic spaces. Also there is no call for great rapidity of movement. The flow of blood in the veins is slow, and of the lymph in its channels still slower. There is no object in performing a movement to empty a vein if sufficient time has not elapsed for blood to flow into it since the last movement ceased. Moreover, a heavy pressure, a very rapid movement, or even a jarring contact may convey to the patient the fear of a possible chance of injury, be the fear conscious or subconscious. A protective reflex may then be established, the muscles may contract, and the one condition under which we can perform our work to the greatest advantage thereby be demolished. If we are fortunate enough to escape this sequel, we shall run the danger of forcing the arterial blood against the stream, unless we keep the pressure we exert within moderate bounds.

Unless contra-indications exist, we may take it for granted that deep stroking should commence over the proximal segment

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of a limb before we attack the distal, so as to ensure the "removal of the cork from the bottle."

In performing all stroking movements the points that require most attention are the position of the patient and of the masseur and the relative position of one to the other. Especially is this the case in the treatment of the limbs. An attempt has been made in Fig. 8 to illustrate common faults in position of the patient and masseur. It will be noted in illustrations 5, 6, and 7 that, contrary to the teaching of some schools, the masseur works from the side of the patient instead of from the end of the outstretched limb. This enables him to ensure an evenness in his work which is well-nigh impossible in the "faulty position." The other point which will be noted, as being at variance with the procedure sometimes advocated, is that the ulnar border of the hand is allowed to lead the movement as freely as the radial border. By this means it is often possible to secure a greater amount of regularity both of pressure and movement.

Deep-stroking massage is frequently applied to the abdomen. It stimulates peristalsis by the reflex response of the unstriped muscle to mechanical stimulation, and may help to move the contents of one piece of bowel into that next adjacent. In treating the cæcum and the ascending and descending colons, this movement may be used with great benefit ; but we must remember that, to attain the greatest benefit, the same rule must be observed which we saw was essential in the treatment of oedema, namely, to ensure that the exit is free before we try to empty it. Thus if we wish to empty the cæcum the place to commence our stroking is over the descending colon, then over the transverse colon (if we know where to find it), and finally over the ascending colon before the area of the cæcum is attacked. Let us remember, however, how great is the difficulty experienced when we try to empty a piece of bowel of its fluid contents by mechanical means.

It is possible also—the claim is usually definitely made but without explanation to justify it—that by our massage we are able to promote glandular activity in the bowel (*cf.* p. 8). The increased peristalsis will undoubtedly assist us directly, and will also aid indirectly by demanding an increased blood

## The Movements of Massage.

supply. At the same time our massage is assisting the abdominal circulation and aids the onward passage of lymph and chyle. Doubtless the improvement in circulation will materially assist the glandular activity. It is, however, a secondary and not a primary effect.

## CHAPTER V.

### THE MOVEMENTS OF MASSAGE (*continued*).

#### 2.—COMPRESSION MOVEMENTS.

THIS is used if we wish to exert local pressure at any definite point, and is usually applied to a series of points.

The movements fall under three heads :—

- (a) *Kneading*.
- (b) *Friction*.
- (c) *Pétrissage*.

A considerable amount of confusion exists as to the definition of the exact movements which should be comprised under each head. The fact is that the movements so closely resemble one another that it may be almost impossible to differentiate between kneading and the picking-up movements of *pétrissage*. From the clinical point of view the line of demarcation appears to be purely arbitrary, as there can be little or no difference in therapeutic effect (provided the part is relaxed) between, say, pressing the superficial flexors of the forearm upon the deep flexors (usually called *kneading*) and picking up the whole muscle group in the hand as far as possible and gently squeezing it (*pétrissage*). The first is a vertical compression of the tissues as compared with the lateral compression of the second. Then, again, friction is a term often wrongly applied to the administration of a purely local pressure given with, say, the tips of the fingers, while kneading is the term applied if the pressure is to be exerted with the whole surface of the hand. “Kneading” is a term which should be confined solely to movements which aim at securing circulatory effect, while “friction” should be held to indicate that the movement is of small amplitude and aims at dispersing the products of pathological change, whether due to past trauma or to chronic disease. Occasionally it is used with other objectives, as will be explained later. There are, however, definite points in the mechanical

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performance of the movements which serve to differentiate them, even though the division between them is arbitrary and the difference of therapeutic effect more imaginary than real.

To be effective, absolute relaxation is essential throughout the performance of the movements. As in the case of *effleurage*, the attainment of this essential *desideratum* can be rendered impossible if the movements are carried out with sufficient vigour to call forth a protective reflex contraction of the muscles. Thus care and gentleness are the key to success: vigour, excessive rapidity, and undue pressure are all inimical. Repetition may serve to emphasise the fact that in relaxation the tissues of the body respond to pressure as would fluid in a bag, and that very slight pressure suffices to empty veins and lymphatics, while any heavier pressure may force the arterial blood against the stream.

(a) *KNEADING* may be applied to the limbs, the back, and the abdomen. It is usually described as a deep movement, but some authors prefer to describe it as "superficial" to distinguish it from the "deep" movement of friction. If perfect relaxation is present, the pressure in either instance must, by all the laws of hydrostatics, be transmitted throughout the segment of the part under treatment, and the movement hardly less so. Thus the distinction between "superficial" and "deep" is unimportant.

(i.) *Kneading of the limbs* is performed with the two hands placed on opposite sides of the limb, the whole of the palmar surfaces being in contact with the part. Gentle pressure is then exerted and a circular movement performed, the hands usually working in opposite directions. Firmer kneading is performed in a similar manner for chronic cases with infiltration of the tissues. The pressure is so regulated that it is not even throughout the movement, but should be greatest while the hand is engaged with the lowest part of the circumference of the circle, and least when at the opposite pole. This is effected by imparting a slight rotation to the wrist, the hand being more supinated below than above (see Figs. 9 and 10). In this way we can imagine that a sort of pumping action is exerted on the fluid contents of the limb. The movement commences over the proximal portion of the limb; the pressure

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is then re-applied at the next most distal part and the movement repeated. The two portions are then stroked firmly, or



FIG. 9.—Kneading. First position.

perhaps the first is again kneaded before a third more distal part is treated. It is sometimes said that the idea of the move-



FIG. 10.—Kneading. Second position. Note the relative pronation. The rotation is exaggerated for purposes of reproduction.

ment is to roll the superficial structures on the deep—in fact the movement is sometimes referred to as “rolling.” In

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perfect relaxation the soft tissues might be "rolled" on the bone; but, as this is usually undesirable and to be avoided with care, the action produced should be rather that of a wave-like motion throughout the limb. The point (or rather pair of points) from which the wave is transmitted is fixed, as distinct from the movable point when the wave is set in motion by deep stroking.

The objectives in view when kneading a muscle mass may be many, and amongst them are the following:—To assist nutrition by reflex *via* the vaso-motor system and by mechanical effect on the unstriped muscle of the arterioles, and so to influence every structure in the limb; to assist the flow of lymph and hasten the removal of oedema; to bring a sense of comfort and well-being to the muscles and thus render them the more ready to perform exercise; and, after exercise, to prepare the way for greater or more prolonged effort by hastening the removal of waste products. There is a common delusion that kneading a muscle—"working a muscle up" is a common phrase—will of itself build up muscular strength. Until this delusion is eradicated massage treatment will never be free of an element of charlatanism. By one means alone can muscular strength be developed, and that is by muscular contraction, and no form of massage can do more than aid this means indirectly. Nevertheless, by excessive kneading it is possible to produce in a wasted muscle all the symptoms of acute fatigue. At the same time massage can beyond all doubt counteract all the effects of muscular fatigue more rapidly than even rest; and is able, by reviving the power of spontaneous action, materially to assist the patient to build up his own muscular strength. None the less it is not the massage which accomplishes the restoration, it is only a means to an end, the end being muscular contraction and relaxation. Kneading can also be used to aid in the stretching of pathological shortening of soft tissues and of adhesions, and is of great service in resolving any general matting together of the former.

(ii.) *On the back* kneading is performed in a similar manner, working from below upwards, so as to impart to each portion of the muscle-mass an alternating wave of compression and

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relaxation. A lateralisation movement is also accomplished. Unless it is desired to loosen anything in the form of adhesions or to disperse pathological deposits, the kneading movement so often applied to the erector spinae has no scientific excuse. It aims, apparently, at forcing the blood in one direction with one hand and in the opposite direction with the other. It is quite easy to obtain the lateralisation effect with deep stroking, and, by using this instead, the flow of fluid in the tissues is maintained in one direction.

(iii.) *Kneading of the abdomen* will be dealt with in a subsequent chapter. Here it suffices to say that a common type of description of this movement is somewhat as follows. Kneading consists (a) of making alternate pressure first with the heel of the hand and then with the fingers—a sort of see-saw movement; (b) of circular kneading by pressure with the radial border of the hand, tips of the fingers, and ulnar border in turn; or (c) of kneading the colon with the palmar surface of the fingers on the ascending colon, rolling the hand over so that the ulnar border presses on the supposed position of the transverse colon, while the ball of the thumb finishes up the movement along the descending colon. A description of this type simply ignores the fact that abdominal massage treatment should be performed not solely to hasten the passage of the abdominal contents, but also with many other objectives. Moreover, the *raison d'être* of the first two movements is not very plain. The see-saw movement might be performed over a piece of small bowel so as to exert pressure in the opposite direction to the flow of its contents, while the second is almost certain to do so at some points. The last movement would probably be better performed by plain stroking and intermittent pressure over one spot. If the idea of performing the movement as described is that any of the contents of the cæcum are thereby pushed into the ascending colon and thence *via* the two flexures and transverse colon into the descending, the sooner it is abandoned as hopeless the better. Yet this is another common delusion which it will take years to eradicate. Were we actually to perform such a feat, the chances are we should be able to produce an involuntary evacuation of the bowels by a mere movement of the hand!

## The Movements of Massage.

Any of the movements mentioned will, however, have the effect that the part of the bowel pressed upon will respond by the contraction of the unstriped muscle to the mechanical stimulus. Care must be taken, however, to ensure that the pressure is not sufficient to tend to paralyse the part pressed upon, in the same way that paralytic vaso-dilatation can be inflicted by the too vigorous massage of a limb. It should be noted that not more than three peristaltic waves pass along any given portion of the bowel in a minute.

(b) **FRICITION.**—In using friction the object in view is to press deeply on the part under treatment and then to move the hand in a more or less circular direction. Any part of the hand may be used, but that generally employed is the tips of the fingers, or tip or ball of the thumb.

It is usual to recommend that the movement should be performed with the elbows straight so that the whole weight of the body may be thrown into the movement.

This instruction is open to great misconception. It would seem that it is often interpreted as implying that the masseur is to throw all the force that is possible into the movement. He therefore holds his breath and stiffens every muscle in the body in his attempt to secure the utmost limit of pressure. All that is needed to correct the misconception is to add to the instruction that the hand must be maintained supple with its muscles relaxed, that no muscle should be kept in a state of fixed contraction, and that the masseur should breathe freely and easily throughout the movement. Again, the muscles throughout the part to be treated must be in a state of complete relaxation. By rhythmical swaying of the trunk through a small amplitude an alternating compression and relaxation can be produced. The amount of pressure exerted can be regulated to a nicety, and by slowly progressive increase in pressure (provided the rhythm is slow and unbroken) no protective reflex will be excited, and far greater depth can be attained than by the exercise of any amount of force. Should any error of technique, such as injudicious haste, give rise to protective or other reflex, the movement should be discontinued until relaxation has again been secured—probably by the means of stroking. So widely does the misconception of the use of body-

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weight in massage seem to exist, that it is necessary to emphasize the fact that force should very rarely have any place in treatment. Pressure, when exerted, should invariably be light at first and steadily progressive, the increase depending solely on the conditions present. When commencing treatment it is always a wise precaution to treat the patient as if he were suffering from a far more serious ailment than is actually present.

When we are faced with pathological deposits, chiefly in "gouty" or "rheumatic" subjects, firm, deep, vigorous friction will alone suffice for their removal. Particularly is this so when the deposits in question are found in the neighbourhood of joints. So, too, considerable vehemence is called for when dealing with old-standing oedema. The *raison d'être* has already been indicated (see p. 19).

If we are able to attend to a patient, who has suffered a recent injury, so quickly that subcutaneous haemorrhage may still be in progress, it is most desirable that sufficient pressure be exerted forthwith to prevent any further effusion of blood; and, before it has had time to begin to organize, to disperse such blood as may have already escaped from the torn vessels. The area must be small, or the injury will be too severe to treat immediately in this manner with any hope of success. If, however, opportunity is afforded, friction with the ball of the thumb forms an ideal method of treatment. The distinction between "friction" of this type and some movements already described as "kneading" is negligible.

In sum, then, all that has been said in dealing with the forms of massage already considered holds good for friction. There is no call for the exercise of great strength or excessive pressure, and either of these may secure one or more of the detrimental results suggested elsewhere as being possible.

Friction is usually advocated to aid the absorption of local effusion and to break up the results of inflammatory processes. The latter term is in massage *parlance* frequently used in a somewhat loose sense, owing, it can only be supposed, to a lack of efficient training. Every masseur should be made to understand—mere verbal instruction is inadequate—how to distinguish between the "inflammation" of the ordinary

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physiological processes of repair after injury, the true inflammation due to sepsis, and that of sub-acute or chronic conditions which lead to the formation of pathological deposits. It is well to emphasize this distinction, as it is quite common to find that it is not clear in the minds of some masseurs. The result is that many a quiescent septic focus has been recalled into full activity through over-zealous endeavour by deep friction "to break up the inflammatory products" following a compound injury. In all places where massage work is being done for the wounded this danger cannot be over-emphasized. If



FIG. 11.—Friction of the iliac colon. Note that every care is taken to ensure that the abdominal muscles are relaxed; and, a point of distinction between this and other movements, that the interphalangeal joints are kept fully extended. It is preferable that the masseur should stand on the left side of his patient. He is shown here on the right side owing to the difficulty of reproduction.

friction is applied to a limb in which the muscles are relaxed there can be no necessity for the use of heavy pressure, and frictions that are administered without undue pressure will rarely set up a recrudescence of sepsis.

Friction is also advocated for treatment of the colon: let us beware of the possible danger of paralysing the unstriped muscle which we wish only to stimulate (see Fig. 11).

Much has been written about nerve frictions, in which the pads of the fingers or thumb are placed on either side of the nerve and the circular movement imparted as the hand slowly ascends along the course of the nerve. Static nerve frictions

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are given by applying the movement to one or more specially selected points on the course of the nerve. One cannot suppose that any benefit can be derived by the axon, which is dependent for its vitality on the integrity of the nerve-cell from which it arises. This is so far removed from the site of our massage operations that the hope of securing any effect upon it is problematical in the extreme. That sufficient pressure can cause a solution in continuity we know: a lighter pressure will only have the effect of irritating, and less pressure still will probably have no effect at all. The result of friction on the neurilemma is a matter for speculation; it is difficult to explain any beneficial action, but easy to imagine the possibility of injury from excess. There remains the sheath. It has its own blood supply—the *comes nervi communicans*—and this is doubtless open to the influence of massage no less than other small blood-vessels. The lymph spaces in and around the sheath can be influenced in similar manner, and we know that in certain ailments pathological products are to be found in the sheaths of nerves. Under these conditions nerve frictions find their *métier*; and, should the deposits have been a cause of irritation, it is easy to understand that, by their removal, the neurilemma and axon are deprived of a definite source of danger and irritation. We know also that one cause of persistent and chronic neuralgia is the presence of minute adhesions which pull or press upon the nerve. It is possible to secure relief in specially selected cases by frictions. Nerve frictions, skilfully administered, have a delightfully invigorating effect. Excess and fatigue go hand in hand.

Nerve frictions should have a strictly limited use, and in all cases should be commenced tentatively. They should never be given in any acute condition, but only where the latter has subsided and active inflammation has ceased. The products of inflammation left deposited in the sheath may then be dealt with by frictions. Nerve frictions should never be administered unless specially prescribed or permitted by the medical man in charge of the case. Their promiscuous use may prove to be a fertile source of injury. It would be hard to produce physiological reasons in justification of nerve frictions in any case where the trouble is due to failure of the nerve-cell or its

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axon. A general working law may be formulated thus:—Nerve frictions are safe if pain is not increased. Little good can be expected from them if the nerve-cell or its axon is diseased or injured. Absorption of pathological products may be hastened, and adhesions stretched, provided a careful watch is kept, and treatment ceases the moment danger signals arise—the chief being the onset or increase of pain.

Friction also plays an invaluable part in the treatment of ulcers and wounds that do not heal rapidly.

(c) PÉTRISSAGE.—*Pétrissage* and kneading are so similar in effect that distinction between the two is uncalled for. The term is usually applied to a movement that consists of “picking up,” as it were, the tissues and submitting them to intermittent pressure. The technique varies slightly in different parts of the body.

It is used for the treatment of the skin and subcutaneous tissues, and serves a very useful purpose when we try to revitalise a dry, scaly skin which has lost its nutrition as a result of long splintage with, or sometimes without, sepsis. To attain this end it usually suffices to pick up the skin and subcutaneous tissues between fingers and thumb and to submit them to a gentle rolling movement. Not only are the tissues rolled between the digits, but the portion so grasped is slid about on the tissues immediately underlying them. It is well, but not essential, that the muscles should be held in a state of contraction. Both hands usually work together. No great pressure is called for, only enough, in fact, to ensure the raising up of the flesh between the manipulating fingers. Dry cupping is of great value in this respect. The technique is described in Chapter XXVI.

For the reduction of adipose tissue, on the other hand, a soft though firm grip is required. A considerable amount of energy may be expended, as now we are attempting by our massage to perform a feat which must amount to little less than the emulsifying of the fat in the connective-tissue cells so that the fat globules may escape into the lymphatic system and be carried away from the part under treatment. It is possible that some of the fat may be “burnt up” by the local increase in temperature due to the local hyperæmia in the part

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manipulated. It is a claim frequently made, but on what evidence is not clear. Personally I am more than dubious as to the possibility of such a process taking place. At least it is safer to be sceptical until the possibility is established by definite scientific research. Until this has been done, the statement can only be made on inadequate grounds, and to put forward unfounded claims tends to bring the whole art of massage into disrepute. In treating this condition the fingers may be allowed to glide over the surface while the pressure is



FIG. 12.—To illustrate “picking up” of the calf muscles. The flexion of knee combined with plantar flexion of ankle ensures relaxation. Adequate lateral support for the knee is essential in this position. If the masseur stands at the end of the bed, the foot should rest with its plantar surface upon it, the knee being flexed to nearly a right angle (*cf.* Fig. 15, p. 60).

being gradually increased. The movement is not comfortable, but any pain which may be caused should be instantly relieved by a little gentle stroking.

Otherwise the movement of picking up is reserved for the treatment of muscle tissue and for the stretching of adhesions and scar tissue, whether these consist of definite bands or of a general matting together of the tissues.

The movement consists of grasping the muscle mass between the fingers and thumb of both hands and raising it away from the subjacent tissues. The tissues grasped are then compressed

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alternately between the thumb of one hand and the fingers of the other. The hands are made to slide gently over the surface till the whole region has been manipulated. Care should be taken to avoid an all too common error in technique, namely, the dragging of the fingers over the surface as if treating adipose tissue, instead of merely exerting an intermittent pressure. The grip should be soft, the whole hand relaxed. Sometimes, when the muscular tissue is sufficiently bulky, each picking-up movement is made to alternate with a kneading movement.

A third method, applicable chiefly to the calf, is performed by picking up the muscle in one or both hands and carrying it from side to side with an inclination to upward movement at the same time. The result is almost a semi-circular movement (see Fig. 12).

It will be seen that the last method of performing the movement amounts to little more than grasping a muscle group and shaking it. The same effect can be attained by kneading, by rapid deep stroking, or indeed by almost any manœuvre of massage. By them all—provided there is complete relaxation—any soft tissue can be submitted to a “shaking-up” process, the severity of which must depend on the condition we are trying to remedy.

All that has been said under the heading of “kneading” applies with equal force to the picking-up movement, but it is well to emphasize the two cardinal points: first, that absolute relaxation is essential; and, second, that, given relaxation, no force or vigour is required to attain the fullest possible benefit. Any movement that calls forth a protective contraction can only defeat our aims, and should be regarded as an error in technique.

## CHAPTER VI.

### THE MOVEMENTS OF MASSAGE (*continued*).

#### 3.—PERCUSSION MOVEMENTS.

PERCUSSION consists of administering a series of blows to the part under treatment, the two hands working alternately. It is commonly known as *tapotement*. The movements usually described are :—

(a) HACKING.—This may be performed with the ulnar border of the little finger, either alone or supplemented in turn by the



FIG. 13.—Hacking. Mildest form. Note wrist action and position of the fingers.

other fingers—the result being a series of soft blows, the first from the little finger direct, the others from each successive finger in turn transmitted through the finger or fingers that have already delivered their tap (see Fig. 13). Sometimes the little finger is curled up in the palm of the hand, and only the middle fingers are used. If a more vigorous action is deemed necessary, the ulnar surface of the whole hand may be used with all the fingers kept close together and contracted but not rigid. The tips or palmar surfaces of the three middle fingers can be used; and a complicated movement called “*tapotement à l'air comprimé*” has been devised in which the palm is

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kept concave with the phalanges fully extended until the moment the hand is about to come in contact with the body, when the whole surface of the palm of the hand and fingers is rendered suddenly convex, the fingers being opened and extended. The movement is performed from shoulder, elbow, and wrist combined. It is only used in heart treatment: its value is speculative, and presumably it can only act by reflex due to rhythmical skin stimulation. As a psychical method of treatment it may be of greater value (*cf. p. II*).

(b) CLAPPING.—The hands are held so that the fingers and palm form a concave arch, and in this position they are brought

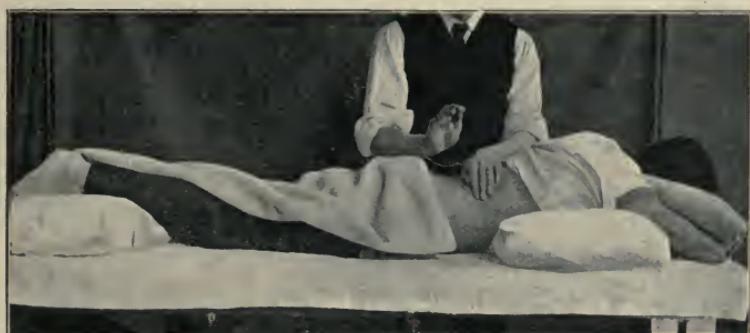


FIG. 14.—Clapping. Note the wrist action and the manner in which the pillows are arranged for the comfort of the patient.

sharply into contact with the body. The result is a rather deep-toned clapping sound. Applied to the chest, it aids the interchange of gases, stirs up the residual air, and assists in the loosening of mucus. This movement, like hacking, should be performed chiefly from the wrists (see Fig. 14).

Ordinary hacking is used over the chest in the treatment of heart cases, but requires great care. Its action on the heart (if any) is due to reflex; but, if vigorously performed, it might act directly on the heart muscle. The effect on the lungs is similar to that of clapping. Over the abdomen the application of hacking or clapping assists to tone up the abdominal muscles through the agency of the abdominal reflex, and can stimulate peristalsis by the mechanical stimulation of the unstriped muscle of the bowel. These movements should rarely, if ever,

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be used on the abdomen. If used, the performance must be very gentle.

Some students are actually taught to perform the hacking movement against the sharp edge of a marble mantelpiece. This may be a wise precaution when the individual attention given during training is inadequate to ensure the development of a satisfactory technique.

When efficiently performed the application of these movements is most pleasing and refreshing. For this reason it is sometimes a good plan to use either clapping or hacking as part of the treatment to be given between the performances of various exercises ; but almost any other form of massage serves at least equally well.

(c) BEATING.—This is the most vigorous form of percussion massage. The fist is half closed, and either the ulnar or the palmar surface is used for beating the surface of the body. If no force is put into the movement, it may be used over bony areas, such as the sacrum, and over areas well covered by muscle, such as the gluteal region. As our only hope from its use in these regions is to secure a reflex action, it should be performed lightly. Used over the ribs, it helps to "shake up the liver," and serves generally as the most vigorous form of massage. The knuckles of the clenched fist may be used vigorously if a purely moral effect is desired. In the case of a malingerer in a military hospital the energetic performance of this movement in the presence of the other occupants of the ward may work a rapid cure. It should, of course, be applied by the surgeon in charge, and then only if his diagnosis is incontestably correct. This treatment is not massage.

It is usually stated that percussion massage produces its best effect if the muscles of the part are maintained in a state of contraction, and some masseurs appear to believe that this movement can strengthen the muscles. We know that muscle will respond by contraction to mechanical stimuli under suitable conditions, and it is thus that we witness the phenomena known as tendon reflexes. But we know equally well that one of the tests for severe nerve-lesion is the attempt to elicit contraction of certain voluntary muscles in response to direct mechanical stimulation. Unless the stimulation is sufficient

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to call forth a protective or irritative reflex contraction, the normal muscle will not respond by contraction to mechanical stimulation. Thus we cannot expect that healthy muscle will contract in response to any form of percussion massage which is administered with a mildness that is not sufficient to elicit one of these reflexes. There is one exception. The abdominal muscles will respond, but only on account of the ordinary abdominal reflex, which, in itself, is probably protective. Similarly, the plantar and cremasteric reflexes can be excited by any form of percussion massage. It should be noted that it is essential to avoid touching the inner surface of the upper part of the thigh during the administration of any form of massage treatment, unless it is the site of actual injury, when the nerves of the part will probably have sustained injury and the reflex arc will thus be destroyed.

If the healthy muscle will not respond, far less will a paralysed and flaccid muscle do so, though a spastic muscle will of course contract. If we are dealing with a case of flaccid paralysis, it is obviously impossible that our first law in using percussion can be respected, namely, that the muscles must be maintained by the patient in a state of contraction. It should, therefore, be abolished from all treatment for the paralysed until such a time as voluntary contraction has not only been restored, but has been sufficiently restored for the patient to be able to maintain it throughout treatment, or until spasticity has vanished. If the paralysis is of the postural variety, gentle percussion may be used when recovery is progressing and the effects of the pressure are passing off. The promiscuous use of the movement so often encountered regardless of conditions present, indicates once more lack of adequate teaching and training, and constitutes a gross error of technique.

When, however, muscular tone is present but deficient, it can doubtless be improved by percussion massage ; but the restoration is so poor compared with that following the use of electrical stimulation that it is little better than waste of time, if a battery is available.

If the muscles are allowed to remain relaxed, the effect will be a more or less general "shake up." This will be obvious if we remember that a limb in which the muscles are relaxed

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compares not unfavourably with a rather well-filled rubber hot-water bottle.

Spinal back hacking induces a sense of warmth and invigoration, and is often of service if a patient has become "chilly" from any cause.

The percussion movements are described as "stimulating," and as such are frequently recommended for neurasthenia, owing, apparently, to the confusion that exists in some minds between neurasthenia and hysteria. It would be hard to find the neurasthenic who would prescribe them for a fellow-sufferer. For such they constitute a refined method of torture. In the very late stages of convalescence they might find a place, but other methods of treatment are even then to be preferred.

If used over the reflex areas, such as the gluteal region, over the great sciatic notch, or over the left lower ribs, it is possible at times to secure by percussion a marked reflex contraction of the lower bowel or of the stomach. No attempt should be made to do so in young people, especially boys.

The skin vessels contract at first in response to the movement, but there is usually a subsequent dilatation which remains for a length of time entirely proportionate to the vigour of the treatment. It is thus possible to produce a flushing of the skin.

The nerve-endings are of course stimulated by the movement; but, if it is prolonged or vigorous, an almost complete numbing effect can be produced. It is not beneficial, however, as it is due to sheer fatigue from over-stimulation; and as the fatigue passes off irritability follows.

Percussion over the ribs is performed with the idea of stimulating the liver, but whether the action in this respect is real or imaginary is a matter for speculation. By its means we can undoubtedly "shake up the liver," and it is possible this may assist the flow of bile. The question has been more fully dealt with elsewhere (see p. 25).

Percussion over the sacrum is of assistance in atony of the bladder or rectum, and is particularly useful in post-anæsthetic bladder and rectal inactivity. Unfortunately it is seldom that it can be applied as a post-operative measure. It should never

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be administered to children, and should always be used with caution.

Percussion should be prohibited over any muscle that is abnormally contracted, over any sensitive area, over any paralysed muscle until its contractility has been restored, or in neurasthenia during any but its latest stages, and probably even then.

It will be surmised from the above account, and from the frequent advocacy during the preceding pages of gentleness, that the author is anxious to impress the essential desirability of exercising care and gentleness throughout all massage treatment, and not only when dealing with acute cases. During a six months' training in which there is so much to be learnt, and during which clinical experience cannot be other than limited, it is impossible to give adequate instruction for the treatment of every class of case which may be encountered, or to indicate how different may be the treatment that should be given to two apparently similar cases, when due regard is paid to all the circumstances.

Every case that is recommended for massage treatment invariably presents one or more structures in which the general vitality is lowered, and, having been taught that certain massage movements are "stimulating," the masseur (not unnaturally) forthwith applies them. Ask that masseur *why* he does so, and the only answer we get is: "I thought the part required stimulating." Inquire further *what* he is trying to stimulate, *how* the movement he is performing is calculated to attain his end, or even perhaps *why* he thinks stimulation will prove beneficial, and it is rare to receive any satisfactory reply. It is necessary, therefore, to consider exactly what is meant by the word "stimulating" in its application to massage, and to utter a word of warning as to the dangers of over-stimulation.

In routine medical and surgical work the efforts of the physician or surgeon are frequently confined, in the first instance, to ensuring relief for the patient, and sedatives frequently replace stimulants with remarkably beneficent effect.

Thus, considering "accident cases" as a whole, it is safe to

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say the patients will suffer to a greater or less degree from shock to the central nervous system, and that this element in the case is by no means negligible. Often enough it is overlooked, but it should be the surgeon's first care to reduce the effect of shock to a minimum. After fracture the intense spasm of all the muscles which control the movements of a limb is a source of most acute physical suffering, which greatly augments the general "shock."

Few of those who practise massage have the opportunity of realising how profound may be the "general" effect of such purely "local" suffering. Yet it is the daily experience of every surgeon to note the rapid general improvement of all—save only the most severe—"accident cases" the moment the patient is placed under the influence of an anæsthetic. This improvement is due essentially to the complete sedative effect. If ether is given it acts as a powerful cardiac stimulant in addition; but the primary cause of the improvement is relief from the perpetuation, as it were, of the shock. This can be proved by watching the progress of a case of a severe comminuted fracture of the hip when amputation is performed. The patient arrives in the theatre, apparently moribund. The seriousness of his condition is the result of shock, since there may have been but little loss of blood and sepsis has had no time to play its part. Improvement is noticed directly anaesthesia has been induced, the heart-beat becomes slower and stronger, the pulse increases in volume and tension, while the colour improves and the cold, clammy sweating ceases. Moreover, the improvement is continuous, in spite, it may be, of the infliction of further "injury" by the surgeon, simply because the torn and otherwise damaged tissues—especially nerves and skin—can no longer send up their inimical impulses to the cord and brain from the mangled site of injury.

After the anæsthetic, saline may be given—perhaps alone, perhaps with stimulant in the form of brandy, pituitary extract, adrenalin or ergot, or perhaps with food in the form of dextrose. All these help to tide over the immediate emergency; but last, to minimise the shock as much as possible, most surgeons rely on morphia. The whole of Crile's theory of anæsthetic-association is based on the prevention of stimuli reaching the brain from

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the site of operation, or, in other words, the prevention of shock due to local injury.

If surgeons, then, note and utilise the beneficial effect of sedatives—and note also the too frequent inimical effect of stimulants, such as strychnine—in the treatment of the result of injury upon the central nervous system, the masseur should follow suit, no matter what the cause of the injury may be, whether physical or psychical.

Again, consider the patient with advanced heart disease who is rapidly failing. A small dose of heroin will often produce a markedly beneficial effect when every stimulant in the pharmacopoeia has been tried and found wanting. The masseur should, therefore, try equally to soothe the voluntary muscle when "fagged out," not to stimulate it.

If we consider the action of a "stimulating" electrical current on the ordinary muscle-nerve preparation from a frog, the first effect we notice is contraction of the muscle. Surprisingly soon, however, we note the signs of fatigue. When this has advanced so far that the muscle fails to respond, response can still be elicited by application of the electrode direct to the muscle. This indicates that the fatigue is in the nerve—not in the muscle. In using the movements of massage as a means of stimulation we must remember that fatigue and stimulation go hand in hand. Moreover, no muscular response will be obtained from massage unless we are treating a case of advanced nerve disorder, or dealing with an area where it is possible to excite one of the skin-muscle reflexes, or unless we use some form of massage which excites a protective contraction. But we have seen that fatigue of a nerve precedes muscle fatigue, and it is possible to stimulate a nervous system to exhaustion without any visible sign at all. Many a long-distance runner, for instance, is able to sprint the last few hundred yards of a race under the stimulus of sheer will power, without showing evidence that his whole central nervous system is so "done in" that complete unconsciousness will follow a few seconds later. Even when insensible the muscles respond readily and easily to faradism, showing that the fatigue is of the central nervous system rather than of the muscles.

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Passing to fatigue of the sensory nerves, we find that a moment of over-stimulation of the second cranial nerve—say by glancing at the sun—is adequate to produce prolonged fatigue. If the stimulus is prolonged it results in permanent blindness, a not infrequent catastrophe amongst children in southern countries. Over-stimulation of the auditory apparatus for a single moment results in a deafness depending for its severity on the strength of the stimulus; while any stimulation of the olfactory nerve or of the nerve of taste renders them temporarily incapable of rightly interpreting any fresh stimulus.

So far we have dealt with nerves of special sense, and it may be claimed that these are more susceptible to fatigue than other nerves.

In ordinary life few spinal sensory nerves suffer over-stimulation from direct injury, but many know the effect of mechanical over-stimulation of the ulnar nerve, and how very slight may be the injury which leaves long and most unpleasant after-effects. When nerve fibres are thus stimulated in bulk we are readily conscious of the effect, but it is not difficult to believe that deleterious effect could be produced in a single fibre almost without affecting the consciousness of the individual.

Very slight mechanical stimulus suffices to over-stimulate unstriped muscle—be it of the arterioles or the bowel. The danger in the latter instance is known to all abdominal surgeons, who realise that the amount of paralytic ileus after operation will depend directly on the amount and severity of the manipulation to which the bowel has been subjected.

The first effect of percussion on the skin is a blanching of the part due to vaso-constriction, but this is soon followed by flushing due to vaso-dilatation. Both phenomena cannot be due to reflex in response to the same stimuli, as would be the case were we to accept the teaching that the blanching is due to stimulation of the vaso-constrictor mechanism and the flushing to that of the vaso-dilator. Were this the case the reflexes must take place together instead of one following the other in definite and unalterable routine. Different impulses give rise to different reflexes, but it is incredible that identical stimuli should secure diametrically opposite reflexes simply

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as the result of repetition. The only explanation is that the blanching is due to the contraction of the unstriped muscle in the arterioles in response to mechanical stimulation, and that the subsequent dilatation is due to paralytic relaxation, which is due, in turn, to over-stimulation. It is conceivable that the phenomena might follow a pure skin-muscle reflex. If so, the reflex is one which causes constriction until the nerves of the reflex arc are so wearied by stimulation that nerve paralysis replaces the muscular paralysis, already considered as the more likely of the two possibilities. Moreover, we must remember that not only skin vessels are affected by our manipulations, but every arteriole, throughout the whole body, which may be subjected to the impulses.

On voluntary muscle fibre the effect of percussion is difficult to elucidate. It can cause it to contract only if used over reflex areas, or in the presence of certain diseases of the central nervous system or as a protective reflex. As a remedial agent, therefore, percussion has but feeble power in this respect. To hasten removal of waste products other means are more effective.

If "stimulating" massage for the moment is taken as being equivalent to "vigorous," and if we consider its action as a whole, we find that on the circulation the action is to "stimulate," but only if used very gently and very sparingly; if used to the faintest excess the action becomes inhibitory. This also applies to local heart treatment, as the heart is only a specialised blood-vessel and its muscle responds to mechanical stimulation in a precisely similar manner to other blood-vessels. On the nervous system the effect is "stimulating," but it is a stimulation that is almost inseparable from fatigue. It is therefore contra-indicated, save in its very mildest forms, if for any reason the nervous system of the part has been fatigued, or if the "tone" of the nervous system has been lowered, *e.g.*, after severe traumatism or as part of the general deficient innervation of neurasthenia. On voluntary muscle tissue its beneficial effect is negligible, while on the unstriped muscle of the abdominal organs the "stimulating" effect is a close forerunner of fatigue.

"Stimulating" massage should therefore be applied only in carefully selected cases; it is the non-realisation of its dangers

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which has in certain quarters brought so many accusations upon massage as a whole. Any rapid or vigorous movement of massage which is given for its "refreshing" effect should, therefore, be administered sparingly, otherwise fatigue will follow. Massage used in this way corresponds more or less to the cold plunge or shower after exercise. If used aright it is most refreshing and invigorating; if abused the result is not infrequently disastrous. This form of "stimulating" massage finds its *métier* either after exercise or between the performances of different exercises.

Massage is not a panacea for all ills, but there are few conditions in which it cannot be used with benefit to the patient. Yet there are few medical men who really believe in the effect of massage, and many never utilise it at all, because when tried in a few cases they have found it fail them. The failure has been due to misuse and abuse, and both can usually be traced to one of two causes. First to the untimely and excessive administration of "stimulating" massage. Take as example the following experience:—The patient—worn out, it may be, by years of over-strain, anxiety, and physical exertion—who is at last unable mentally or physically to expend another ounce of energy, is found by the masseur totally lacking in vitality. "What is the matter here, I wonder?" says the masseur, if he is conscientious. "Doctor said it 'was just a case of nervous breakdown and that there was nothing organically wrong with him,' and yet he says he can't get up and go about his business. He just wants a thorough, good, stimulating massage all over." And he gets it! Small wonder then that the patient, whose whole illness, be it observed, is due to over-stimulation, becomes rapidly worse.

The second source of disappointment in the effect observed after massage treatment is to be found in misuse rather than in abuse; and, as a general rule, this is to be observed when massage has been called upon to "work up" the strength of a muscle or to re-educate it in the performance of its latent or forgotten function—in other words, in those cases in which massage has been expected to achieve results that can only be attained as the result of voluntary contraction or of skilled re-education.

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It is not uncommon to find that a misconception of the word "stimulating" has arisen in the minds of some masseurs. They appear to believe that only the more or less vigorous or violent movements of massage have a stimulating effect. This is incorrect. Even the light surface-stroking massage aims at nothing save so to stimulate the sensory nerves that a reflex response may be secured. Deep-stroking and all forms of compression massage owe their reflex action either to a similar process of stimulation or to reflex response to a mechanical stimulus. All forms of massage are essentially stimulating, even if the effect of the stimulus is such that the patient is conscious only of a sedative effect. Just as morphia or heroin may serve as the best cardiac stimulant, so surface-stroking may be the best form of "stimulating" massage to administer to a patient. But the delusion is deep-rooted—and it will die hard—that "stimulation" in massage is impossible without the expenditure of muscle energy and vigour. A delusion, nevertheless, it is; and nothing will eradicate it until the time comes when the duration of training for the massage student is adequate to ensure a sufficiency of clinical experience. This, and this only, can impart a full appreciation of the use and abuse of massage.

Two movements remain to be described which, although they may be performed in a special manner, as separate movements of massage, can yet be imitated so closely under suitable circumstances by other movements that they hardly merit separate notice. They are *vibration* and *shaking*.

Let us return once more to our conception that a healthy limb, in which the muscles are relaxed, may be compared with a rubber hot-water bag filled with fluid. Thus almost the faintest touch can send, as it were, a wave of movement throughout the limb. This fact established, it is clear that any of the movements already described, with the exception of the superficial stroking, are able to impart in a greater or less degree a vibration or shaking movement throughout the area of the limb treated.

In disease, however, we must imagine that the water in the hot-water bottle is replaced by treacle, liquid glue or dough,

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according to the condition present ; and, in addition, we must imagine that sometimes the bag is divided into compartments, each communicating with its neighbour by a comparatively small opening. Each phase would offer more resistance to the transmission of vibration, and hence we are bound to devise some effective means of overcoming the resistance when dealing with pathological conditions which have increased the " viscosity " of the " fluid " content of the " bag " of skin surrounding the limb.

For limb treatments particularly, and for special cases else-



FIG. 15.—Shaking the calf-muscles. Note the loose grip, and that both hands can work simultaneously.

where, hand vibration is a poor substitute for many of the mechanical vibrators on the market. The best are those run from an electric motor contained in the apparatus. The rate at which the vibrations can be administered should be under control. Although the vibration is so " fine," it must be classed as a " stimulating " movement. Therefore these instruments should only be applied with caution, and never to the same spot for more than two or three moments at a time. For reducing oedema, stretching adhesions, loosening scars, and even for loosening joints, vibration is invaluable. The addition of vibration to deep stroking of the abdomen may assist the

## The Movements of Massage.

mechanical stimulation whereby we hope to secure the reflex contraction of the unstriped muscle. All massage movements intended to act on any organ under cover of the ribs by direct stimulation, do so only as the result of the vibration transmitted from the chest wall.

Nerve vibrations are much advocated: nothing need be added about them to what has already been said on the subject of nerve frictions.

*Shaking* is merely a coarse vibration. When dealing with a limb the most satisfactory method of administering shaking is to apply the hand to the surface as if preparing to perform the deep stroking movement, subsequently withdrawing the palm slightly, leaving the fingers in contact with one aspect of the limb, the heel of the hand or the extended thumb being in contact with an adjacent surface (see Fig. 15). The whole hand is then moved as if the deep stroking were to be performed, but, at the same time, a quick, firm, vibrating movement from side to side is added.

Although vibration and shaking, when performed as special movements, resemble percussion massage more closely than any other variety, it is essential that they should be performed with all the muscles in a state of complete relaxation. Care must be taken, therefore, that the movements are not sufficiently violent to excite a protective reflex contraction. This frequently occurs if great rapidity of vibration is employed with a mechanical vibrator, but usually it denotes that undue pressure is being exerted. When any shaking movement is applied to the abdomen care must be taken to ensure that the position of the patient is such that the abdominal muscles are completely relaxed, and that no surface irritation excites their reflex contraction.

## CHAPTER VII.

### MOBILISATION AS A SEQUEL TO MASSAGE.

#### 1.—RELAXED MOVEMENT (PASSIVE MOVEMENT).

As stated in an earlier chapter, massage is merely a means to an end—the end being restoration of function. There are a few cases in which massage treatment alone suffices to attain it, and as a rule it is only in the earliest stages that treatment should cease simultaneously with the massage. In the treatment of a limb massage alone rarely, if ever, suffices ; if we are treating an abdomen with massage and fail to prescribe some form of mobilisation, we are depriving our patient of the benefits of a potent remedy. For the paralysed, mobilisation is invaluable ; even for heart cases active movement can always be prescribed with benefit, if it only consists of teaching the patient to maintain the tone of various muscle-groups by alternate contraction and relaxation.

Only when we wish to compel complete relaxation and to enforce rest on a nervous system which, in part or completely, refuses to rest, can massage alone be considered efficient without its complement—mobilisation. Even so, when we have succeeded in our attempt to secure relaxation—be it mental or physical—our work has only just begun ; and we are then left with one of the most difficult tasks to accomplish, namely, the restoration of function in such a manner that all danger of return of the original symptoms is avoided. This is really a process of re-education of function—it may be even of mental function. For instance, it is no uncommon thing for a neurasthenic to be restored to health while in bed, but the moment physical exertion is allowed the patient relapses. This is often due to confusion in the patient's mind of the sensations due to physical fatigue and those which were endured as part of the original illness. A few words of warning and explanation may avert catastrophe should the sensations due to physical fatigue

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arise ; while the onset of the fatigue can usually be avoided by an intelligent course of treatment by mobilisation.

It is essential in the first place that we should understand the full meaning of the expression "treatment by mobilisation." It consists of two main divisions :—

- I. The administration of passive or relaxed movement.
- II. The prescription of active movement.

### *I. Passive Movement.*

Many masseurs seem to think that when passive movement is ordered it is their duty to move the part through the widest range that anatomical considerations will allow. Nothing could be a greater delusion, as usually the prescriber wishes only a minute movement to be given the first day, with small additions day by day as the condition improves. To be truly passive the movement must be carried through by the operator without either assistance or resistance from the patient. Unless the part is completely paralysed this entails the co-operation of the patient. It is difficult to allow any part of the body to become absolutely relaxed, and particularly so when that part is being moved. It is possible : but it is often necessary to teach patients how to do it, and this may require much time and patience. Without the co-operation of the patient in this active relaxation, passive movement is inconceivable, as, in its absence, the movement becomes either an assistive or a resistive movement.

I have found it so difficult to impress on those working for me that the patient's co-operation is essential to the administration of true passive movement that I have abandoned the use of this term altogether and adopted that of "relaxed movement."

The difficulty in securing active relaxation is so great that attention to every minute detail, which may be helpful, is imperative.

The first essential is that the patient should be in a position of absolute ease and comfort, in one of the natural positions of perfect repose.

The second is that the masseur should be in a position which renders it possible to support the part under manipulation in

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such a manner that throughout the movement, no matter what it may be, the patient still maintains the full sense of ease and



FIG. 16.—To show flexion of fingers with extension of the wrist.



FIG. 17.—To show extension of fingers with flexion of the wrist.

repose. To secure this the masseur's movements must be so free from embarrassment that the sensation of absolute security is conveyed to the patient. The faintest trace of insecurity

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will be countered by the voluntary or involuntary contraction of the patient's muscles.

The third essential is that the masseur should bear in mind the natural positions of repose, and should remember how the patient would perform the movement prescribed were he to do so voluntarily in the position chosen.

Nature has decreed that most of our movements should be in reality a combination of movements, the result of an elaborate



FIG. 18.—Showing the position in full extension of the wrist.  
The forearm is pronated and fingers are flexed.

co-ordination of muscular contraction and relaxation. If we wish our patient to maintain a condition of active relaxation, it is essential to copy, so far as lies in our power, the movements that result from this co-ordination.

The following list will serve as a guide; the combinations must be duly regarded whichever of the two or more movements constitute our chief aim. Moreover, for our technique to be perfect, it may be necessary to perform two or more combinations at the same time:—

Flexion of the fingers should be combined with extension

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of the wrist : extension of the fingers with flexion of the wrist (see Figs. 16 and 17).

Extension of the wrist should be combined with pronation of the forearm (see Fig. 18) : flexion of the wrist should be administered as the forearm movement passes from full pronation to a position mid-way between pronation and supination (see Fig. 19).



FIG. 19.—Showing full flexion of the wrist. Note the rotation of the forearm as compared with Fig. 18, and also the unaided extension of the fingers.

tion to a position mid-way between pronation and supination (see Fig. 19).

Lateralisation of the wrist in both directions can be performed in this position, but it is safer to begin with ulnar deviation and to pronate the forearm slightly while performing the radial movement (see Figs. 20 and 21).

All relaxed movements of the wrist and rotation of the forearm can be performed with the patient recumbent and the

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FIG. 20.—To show ulnar deviation of wrist.

forearm vertical. The posterior surface of the arm should rest on the couch (see Fig. 41, p. 88). Adequate support is essential during flexion and extension of the wrist in this position. In the upright position supination of the forearm should be com-



FIG. 21.—To show radial deviation of wrist. Note slight relative pronation.



FIG. 22.—To show full supination of forearm with flexion of elbow.



FIG. 23.—To show how the forearm should be carried across the front of the chest (as if it were resting on an adjustable sling) when changing from supination to pronation.

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bined with flexion of the elbow : pronation with its extension (see Figs. 22, 23, and 24).

Flexion of the forearm is most easily performed if the elbow is pressed backwards at the same time, *i.e.*, during extension of the shoulder : extension of the elbow is performed while the



FIG. 24.—To show pronation of forearm with extension of elbow. The positions should be compared with those shown in the two previous figures.

shoulder is flexed and the arm carried forwards (see Figs. 25, 26, 27, and 28).

Abduction of the arm is combined with flexion of the elbow : during adduction the elbow should be somewhat extended (see Fig. 29).

Flexion of the toes should be combined with dorsi-flexion of the ankle : extension with plantar flexion (see Figs. 30 and 31).

Plantar flexion of the ankle calls for extension of the knee,



FIG. 25.—To show position for all early relaxed movements of elbow or shoulder. Note the combined flexion of elbow, extension of shoulder and supination of wrist.



FIG. 26.—Note the position at each joint in contrast to those shown in Fig. 25.

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FIG. 27.—To show another position that may be used during later stages of treatment for mobilisation of shoulder and elbow, the latter being extended.

though the knee should be kept slightly flexed even when the ankle movement is at its extreme : - dorsi-flexion requires increasing flexion of the knee.

Flexion of the knee should be combined with flexion of the



FIG. 28.—The same as Fig. 27, showing elbow flexed. Note again the rotation of forearm.

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hip: extension of the knee with extension of the hip (see Figs. 32, 33, 34, and 35).

Adduction and abduction of the hip is best performed with



FIG. 29.—To show one position in administering circumduction of shoulder. The support given by the masseur's right hand and arm is identical with that shown in Figs. 25 and 26.

knee and ankle semi-flexed: its rotation requires alternate flexion and extension of the knee, flexion accompanying that part of the movement when the hip is most flexed, and extension of the knee the part when the hip is most extended (see Fig. 35).

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It is almost impossible to administer a dose of relaxed movement to the lower limb except in the presence of some degree of flexion of the knee.

In all movements of the knee the slight rotatory movement



FIG. 30.—To show flexion of the toes with dorsi-flexion of the ankle. Note the knee is bent.

which is possible must be kept in mind and be administered in flexion. In the same way, all interphalangeal joints are capable of lateral movement, but in a slightly flexed position : the inferior radio-ulnar joint frequently calls for antero-posterior mobilisation, most freely obtained with the forearm between pronation and supination, the amount lessening towards

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FIG. 31.—To show extension of the toes with relative plantar flexion of the ankle. Note the knee is slightly extended as compared with Fig. 30.



FIG. 32.—To show most useful position for mobilisation of the knee. Note the "play" of the masseur's feet when comparing these figures and Nos. 33 and 34.

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the two extremes of rotation (see Fig. 36). The joints at the bases of metacarpals and metatarsals are frequently overlooked, but they should all receive their dose of movement (see Fig. 37). The most important of all the joints at the bases of the metacarpals is of course that at the base of the first. It must always be kept in mind that the power of opposition of the thumb is the one vitally essential movement in the whole hand. Without it the function of the upper extremity is



FIG. 33.—To contrast with Fig. 32. The control in these positions is perfect.

largely reduced to impotence for most of the ordinary usages of life. It is well, however, to remember that fixation of the metacarpo-phalangeal joint of the annularis in a straight line is a crippling deformity of great severity. The existence of impediment to movement in these joints—often quite easy to correct—is a source of great weakness to the grip, or may be the cause of otherwise unaccountable limping due to pain in the foot. Though no true joint exists, mobilisation should be administered to the heads of metatarsals and metacarpals. It is often surprising to find how readily movement returns to

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fingers which are apparently quite stiff in extension, if the heads of the metacarpals are loosened until a palmar concave arch is visible. If the fingers are fixed and bent, the first step in treatment should be to flatten this arch. The same applies to manipulation of the foot. It is difficult to mobilise the carpal joints, but not so the tarsal joints. These should always receive care and attention, especially the astragalo-scaphoid



FIG. 34.—Another method of securing flexion of the knee, the thigh being fixed. The masseur should be standing further to the right at the side of the patient, but this could not be shown in the photograph.

and calcaneo-cuboid joints. A firm grip is taken of the foot on either side of the joints, and an "up-and-down" movement is imparted, combined with an attempt to perform rotation of the anterior part of the foot upon the posterior.

Mobilisation of the phalanges of the hand is frequently mismanaged, with the result that a mild degree of tendon insufficiency is left undiagnosed and untreated. It often happens that after injury a patient is told to keep the fingers supple by movement. The patient obeys; but, owing to lack of instruc-

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FIG. 35.—To show position for administering movement to the hip. The same position is also of service when mobilising the knee.



FIG. 36.—To show the grip for lateralising the inferior radio-ulnar joint.

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FIG. 37.—To show the grip for loosening the joints between the bases of the second and third metacarpals.

tion, movement takes place only at the interphalangeal joints. The range of movement at the metacarpo-phalangeal joints then becomes limited and the impairment of movement is most



FIG. 38.—First position in performing flexion of a single finger. The metacarpo-phalangeal joint is fully flexed. Note the extension of the wrist. Either the index finger or the thumb may be used to perform the movement. (For further details of technique, see Chap. XVII.)

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FIG. 39.—Second position in performing flexion of the fingers. The proximal interphalangeal joint is fully flexed, the metacarpo-phalangeal has been slightly extended.

disastrous. Unless there is obvious impediment to such a procedure, the technique of mobilisation for the fingers is to extend fully each joint in turn, commencing with the distal



FIG. 40.—Third position in performing flexion of the fingers. The distal interphalangeal joint is fully flexed as well as the proximal. To effect this the metacarpo-phalangeal joint has been fully extended.

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interphalangeal joint. Flexion should then be undertaken by bending down to its full extent the metacarpo-phalangeal joint ; the first interphalangeal joint is next dealt with, but towards the limit of its flexion that of the metacarpo-phalangeal joint must be *slightly* relaxed. As we continue this relaxation slowly, the terminal interphalangeal joint is fully bent and is maintained in this position while the metacarpo-phalangeal joint is straightened. The proximal interphalangeal joint is then straightened, and finally the distal (see Figs. 38, 39, and 40).

It is essential to bear in mind that flexion and extension at all the finger joints is not a pure hinge movement. Thus, during flexion of the proximal phalanx on the metacarpal, the base of the former performs a distinct gliding movement over the head of the latter. Forceful movement performed with disregard of this important fact simply inflicts a severe strain on the posterior ligaments, and the result is often disastrous. When there is considerable stiffness in the finger-joints the positions shown in Figs. 38—40 are not ideal for the administration of forced (or assistive) movement. The alteration required (too difficult to show in an illustration) is that the masseur's left hand should be engaged, not only in giving support, but in actively pressing back the head of the proximal bone while the right hand glides the base of the phalanx over it.

In dealing with the toes the same routine should be followed ; but here we find that, as a rule, it is the interphalangeal joints which the patient fails to exercise for himself and which tend to get fixed, while the metatarso-phalangeal joints often remain quite supple.

Clinical observation has shown that, for some reason which is not quite clear, forced mobilisation of the fingers and toes, when this is painful, can best be performed if we first exert tension in the long axis of the digit and then proceed with the movements of flexion, extension, rotation and lateralisation. Much pain can be obviated by observing this simple rule in technique. A possible explanation is that, by exerting tension, we unconsciously tend to produce the gliding movement that is essential to success. Particularly is this so if, while exerting tension on

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the digit with one hand, we employ the other in such a manner as to exert pressure in the opposite direction on the head of the proximal bone.

The aim of relaxed movement is to maintain suppleness, *i.e.*, to prevent contractures and the formation of definite adhesions or a general matting of the soft tissues. "Little and often" should be our guide while performing such movement as can be carried out with perfect ease and freedom, each movement being almost imperceptibly greater than the preceding. As the limit of movement that has been reached on a previous occasion approaches, the frequency gradually decreases till finally any additional movement beyond the previous limit is performed only once. To secure the additional movement—no matter how slight it may be—is the chief aim in view, as a single relaxed movement through the extreme limits possible is of more value than a hundred movements through three-quarters of the possible range. At the same time we must remember that any trace of pain, of unevenness in our movement, of doubt in the patient's mind—conscious or subconscious—of insecurity, will defeat our end by calling up a protective muscular contraction.

It must not be imagined that it is possible to take hold of a limb in which a joint is apparently firmly fixed, and administer a single relaxed movement throughout the full range. The faintest trace of pressure should be exercised in two opposing directions just as if the joint were really moving; even though no trace of movement is seen at first, a minute flicker may soon be noticed. The process is continued, and presently the pressure, which a minute before failed to produce movement, will definitely do so. Gradually the range increases without any corresponding increase in pressure, and so the process is continued till the fullest possible range of relaxed movement has been performed. As the amplitude increases, light surface stroking should be performed continuously, and the movement should cease directly the full range that is possible in the circumstances has been attained. Return to the rest position must be no less gradual than the original movement away from it.

No useful purpose can be served by repeating a relaxed

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movement unless there is a reasonable chance that, by doing so, an increased range of movement will be secured. The proof that the limit of relaxed movement has been reached is the appearance of a trace of contraction in a muscle either to assist or resist the movement, the first trace being a minute fibrillary tremor that can often be detected by the finger when the eye still fails to note it.

Insistence on the true nature of relaxed movement and on the technique that is indispensable to its accurate administration is of paramount importance, for two gross misconceptions on both these points are frequently encountered. There is one school of thought which prohibits the use of passive movement on the ground that its administration is fraught with too much danger, preferring that active movements alone should be encouraged. The reason given is that the patient is more likely to stop short of the point at which danger is to be encountered than even an expert manipulator. The result of "passive movement," as so frequently administered in the absence of the concomitant active relaxation on the part of the patient, has been responsible for so much injury that this view rests on a rational foundation. But experience has shown that, when passive movement is performed only in the presence of complete relaxation, and only when the technique is faithfully followed and the danger signals are duly appreciated, then the prescription of relaxed movement is much more safe than that of active movement, even though the movement is performed through a far wider range. Skilled relaxed movement should be less liable to cause trouble than the regular change of a dressing.

The second misconception is that the administration of relaxed movement is performed as a substitute for the prescription of active movement. This idea has arisen from sheer ignorance, though it is an ignorance that has spread, at least in one country abroad, to high official quarters. Just as massage is used as a means by which we can secure relaxed movement, so this in turn is only a means by which we prepare the way for active movement. To call upon a patient who has had an arthroplasty of wrist a few days ago to bend or extend the joint may be to demand the impossible; whereas, after a few

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relaxed movements, active movement may not only be possible but may be actually a source of pleasure and comfort. But active movement through the same range is sure to be impossible, yet the increased movement secured passively will prove of the utmost service on the morrow when the way has been prepared for active movement through a wider range. Thus relaxed movement is futile unless used as a means to an end, and the end is to prepare the way to-day for active movement on the morrow—be it the immediate morrow or one more remote.

The objectives in view in administering relaxed movement might be summarised thus :—

1. Joints are kept supple.
2. The formation of pathological bands and adhesions is prevented.
3. Repair of all normal structures, even of bone, is hastened. Any attempt at movement which is inimical to their repair is attended by pain and reflex antagonism to the movement. Thus passive movement is rendered impossible.
4. The elasticity of the muscles is maintained—by no means an unimportant point in cases of paralysis.
5. The circulation of the venous blood and of the lymph is assisted materially, and hence the removal of waste products, of extravasation and of oedema is hastened.
6. The restoration of any disorganisation in the vaso-motor system is probably assisted very materially—the main factor in effecting repair of injured structures.
7. The joint-sense is re-educated, or its loss is prevented, as the case may be, and thus the main link in the reflex of co-ordinated movement is restored or maintained.
8. The way is paved for the prescription of active movement.

Let us for one moment contrast these beneficent effects with those that follow the administration of movements in the absence of active relaxation on the part of the patient :—

1. In the absence of relaxation the movement of the joint is forced, and therefore strain is placed upon it. The result is that any synovitis or other pathological condition is perpetuated or increased.

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2. There is great danger of inflicting further injury on the already damaged structures, so that adhesions of greater density and strength will ultimately form.
3. Repair is retarded owing to undue strain on the structures that are undergoing repair.
4. The muscles are strained, and possibly even torn, in their vain attempt to resist the movement.
5. The circulation of the venous blood and of the lymph may be assisted, but extravasation will be increased ; and
6. The disorganisation of the vaso-motor system is increased as the result of repetition of trauma, and so oedema increases in proportion as repair decreases.
7. The joint-sense is outraged by repeated trauma, and all power of co-ordination is thereby destroyed.
8. Pain being the most powerful of all agencies in inhibiting active movement, the ability to make use of active movement as a therapeutic agent is jeopardised.

Small wonder then that those who are only acquainted with the result of "passive" movement administered without relaxation should condemn it and insist only on the prescription of active movement. But those who are able to appreciate all that I have endeavoured to express in the term "relaxed movement" cannot fail to realise its unique value as a means to the end, viz., restoration of function.

The confusion which exists as to what is meant by "passive movement" has, perhaps more than anything else, tended to postpone the more general adoption of the treatment of recent injury by mobilisation. It must be realised from the outset that "passive movement" is impossible if there is any impediment to be overcome, or if the muscles assist or resist the movement. Also, it can only be performed when the joint is moved in the direction in which, during natural activity, there is the least possible strain on any structure surrounding it. Thus, extension of the elbow, if performed without due respect for the carrying angle, lays a strain on the external lateral ligament of the joint. The movement at once degenerates into a forced movement. To prescribe, as is so often done, treatment by "massage and passive movements" for a stiff joint would be ludicrous were it not for the great harm that such prescription

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produces. The masseur either relies on massage to effect that which it is impossible it should perform, or administers forced movement. In the latter event he may fail to discriminate between "passive" and "forced" movement; and, when true passive movement is required, he may do great damage.

From what has been said it will be evident that true passive movement can only find a very small place in physical treatment. So, too, does, or should, massage. But just as massage is frequently prescribed or given when voluntary effort on the part of the patient is the only thing that can cure him, so "passive" movement may also be given. Massage, used properly, in the right way at the right time, is one of the most valuable of physical remedies. Used wrongly at the wrong time, it is never merely useless but actively detrimental, mentally or physically. The same may be said of passive movement, though the harm done is never serious if the laws governing its administration are respected. Rather is it detrimental in so far as it can replace beneficial treatment in the form of active movement, and hence can retard recovery.

But though the place of passive movement in treatment may be small, it is one of the greatest possible importance in all cases of recent injury. It is, in short, the only prophylactic measure we possess by which we can reduce subsequent stiffness, rapid loss of power and of the joint and muscle sense. One example alone must suffice. After fracture through the shaft of the humerus it may be impossible for the patient to move the elbow unaided for two to three weeks. Absolute fixation of the joint is the worst possible treatment it could receive if there is any traumatic arthritis present as the result of the accident. The triceps and brachialis anticus also are bound, in greater or less degree, to be matted down firmly to the site of fracture. So firm may their adherence become that movement of sufficient strength to free them would tend severely to damage the union. Early mobilisation, on the other hand, by pure "relaxed" movement may well have restored almost complete movement after a similar lapse of time.

In short, the aim of passive movement is to secure movement whenever active movement is, for any cause, impossible. This

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is its only justification ; and, if we can secure to the patient the benefits enumerated above during the whole, or even part, of the time that active movement must be withheld—at the one time of all others, be it noted, that these benefits are of the greatest value—then, as it seems to me, in passive movement we have a remedy that may be truly described as invaluable. Forced movement at the right time and place is of great service too ; but intelligent use of passive movement often reduces the condition for which forced movement is required to a negligible quantity. There can be no possible excuse for substituting the one for the other in treatment, for between them lies another agency—potent for great good—unassisted active movement.

## CHAPTER VIII.

### MOBILISATION AS A SEQUEL TO MASSAGE (*continued*).

#### 2.—ACTIVE MOVEMENT.

THERE is one manœuvre which can often find a place in our treatment, but which cannot be classed under the heading of "movement." It consists of teaching the patient to contract certain muscles, or groups of muscles, voluntarily without moving any joint as a result of the contraction. For example, the quadriceps can be exercised freely even though the knee be firmly fixed by a splint ; the deltoid can be made to contract without any effect on the shoulder-joint. There are two requisites, a little tact and patience on the part of the instructor and perseverance on the part of the patient, if the full benefit is to be reaped. Few things are more injurious to muscular strength than absolute rest ; it is surprising how little exercise will maintain it. Even in the absence of joint movement, the performance of the natural function of a muscle—alternate contraction and relaxation—will often suffice, if not to prevent wasting, at least to minimise it and to maintain its vitality. It will also help to maintain intact the muscle-sense on which co-ordinated movement will subsequently rely.

Active movement may be divided into the following groups :—

1. Free movement,
2. Assistive movement,
3. Resistive movement.

1. *Free Movement.*—We must remember that gravity serves as an effective resistance against which to work, and, if a movement is performed against gravity, we are really performing a concentric movement against resistance ; if with gravity, our movement is assisted. Thus it comes about that, in certain positions, assistance may be required if a movement is to be truly "free." In movement of the shoulder, for instance, if

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the patient is standing, exercise with the weight and pulley may mean that movements of abduction and adduction are almost "free" because the weights counteract the weight of



FIG. 41.—To show the position for free rotation of the forearm, the patient being recumbent.

the limb during the movements. The so-called "free" abduction is a movement against the resistance of gravity if the patient is upright, while adduction is a movement assisted by gravity.

True "free" movement is, therefore, excessively rare; and



FIG. 42.—To show the same position as in Fig. 41, free movement having been performed from almost full supination to full pronation.

the division of movement into "free" and "assistive" is arbitrary. It is useful, nevertheless, as it serves to remind us that active movement may be "active," even though only performed with assistance.

Free flexion and extension of the fingers is best performed

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with the hand supported on its ulnar border, the forearm being held mid-way between pronation and supination. For the exercise of free adduction and abduction the hand should be



FIG. 43.—To show the starting position for free flexion of the elbow. This is also the end position of free extension.

placed flat upon a table, and the fingers are then separated and approximated. It is sometimes of service to keep them rigid by means of light posterior splints.

The forearm being supported in this position with the hand



FIG. 44.—To show the starting position for free extension of the elbow. This is also the end position of free flexion.

hanging free is the correct attitude in which to perform free flexion and extension of the wrist.

Free rotation is performed starting from the same position, the hand being supported or not, according to the nature of the case. Better still, the patient lies flat on his back, the

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posterior aspect of the arm rests on the couch, and the forearm is kept vertical by flexion of the elbow to a right angle (see Figs. 41 and 42).

Free flexion and extension of the forearm is best performed with the patient recumbent, the inner side of the arm and the



FIG. 45.—To show flexion and extension of the elbow while the limb rests on an adjustable board. When the board is horizontal the movement is free except for the resistance due to friction. As its outer edge is depressed flexion is resisted by gravity and extension is assisted.

elbow being fully supported and the hand moved up and down over the chest (see Figs. 43 and 44). The movement is almost free through an angle of 15 degrees in either direction if the forearm is kept vertical. As an alternative method, if shoulder movement will permit, the patient sits beside a table in such a position that its surface is on a level with the axilla.

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The whole arm then rests upon the top of the table while flexion and extension are performed (see Fig. 45).

Free movement of the shoulder entails the supporting, by one means or another, of the weight of the forearm and hand.



FIG. 46.—To show a simple method of reducing the action of gravity on the upper extremity while performing abduction. The hand should be supported by a sling round the neck, omitted in the photograph for the sake of reproduction.

This may be done by placing the patient fully recumbent, the whole weight of the limb being supported by the couch. By means of gradually elevating the position of the couch on which the trunk and shoulders rest, the resistance to abduction and the assistance to adduction can be regulated to a nicety. Other ways of achieving a similar end are by giving manual assistance

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by the aid of the weight and pulley, or by some other device. The resistance to shoulder movements offered by gravity can



FIG. 47.—To show the position for free movement of the ankle. Movement of the toes in this position is also "free."



FIG. 48.—To show the position for free movement of the knee. If the patient's left thigh were drawn back, the knee well flexed, and if the right thigh were drawn forward, extension of the right knee would be assisted by gravity.

be largely counteracted if the elbow is maintained in the acutely flexed position (see Fig. 46).

Free movement of the toes can be performed with the leg flat on its side on the couch.

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Free movement of the ankle can only be performed with the patient lying on his side on a couch, the weight of the leg being supported on the couch or on a pillow (see Fig. 47).

Free movement of the knee necessitates that the patient should assume a position similar to that employed when giving free movement to the ankle. The only difference is that, in this case, it is better that the patient should lie on the injured side (see Fig. 48), though a little ingenuity will enable the movement to be performed when lying on the sound side.

Free movement of the hip is very difficult to secure in any position without assistance from some weight-bearing mechanism. Rotation is almost free when recumbent with the limb fully extended on a couch. By means of a weight and pulley flexion and extension can be rendered almost free when the patient is recumbent, while free adduction and abduction are rendered possible by simple suspension from a cord. As a matter of fact, swinging the whole extremity in the erect posture approximates very closely to a free movement, provided that movement does not exceed a few degrees from the perpendicular. Lying on the back with the knee drawn up so that the sole of the foot rests flat upon the couch, a few degrees of almost free adduction and abduction can be performed.

When making the first tentative experiments with free movement, the patient will often find that his endeavours are crowned with success more readily if the limb is placed in water, preferably hot. The probable explanation of the success of these adjuvants is that the water, by giving perfect and even support to all the parts immersed, removes every trace of external resistance to movement. The tendency of cold to render all movement more difficult by giving rise to a sense of stiffness is a natural phenomena: heat tends to relieve this sense, and movement becomes more easy. The effect of the swirling of the water, if an *eau courante* bath is used, is possibly comparable to the effect of the superficial stroking massage already described. An ordinary bath of hot water is generally as useful as any other form of bath.

It is well, whenever possible, to arrange that any free movement should be performed in combination with other movements as indicated when considering relaxed movements.

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The value of the knowledge of the positions in which doses of true free movement can be administered is realised even less than the value of true relaxed movement. Yet a full appreciation is required as an essential foundation for re-education in cases of extreme weakness and of paralysis. Until these fundamental positions are studied and their value realised all early training must be faulty and progress thereby retarded. The first essential in muscle re-education is to devise something that the muscle, despite its enfeebled condition, can effect as the result of its contraction. The most simple actions any muscle can perform are those that are assisted by gravity. By postural change the assistance thus afforded can be reduced from a maximum to zero—the posture for true free movement—while further change in position adds gradually to the resistance afforded by gravity to the movement. Thus, and thus only, can early muscle re-education be scientifically gradated, and the keystone of the training is the knowledge of the neutral positions, or the positions in which alone true free movement is possible (see Chapter XIX.).

2. *Assistive Movement* opens a wide sphere for inventive capacity in the individual masseur. The assistance given varies from the mildest possible touch to a finger, while the forearm floats in an arm bath, to a vigorous and long-sustained pulling process, while the patient himself is exerting the full power of normal muscle, with all the assistance that can be obtained from gravity and the body-weight.

The object in administering a dose of assistive movement is to enable the patient to accomplish more than he could do unassisted. Thus it may serve its purpose in either of two ways: first, by enabling the patient to perform a movement without undue fatigue or strain; second, by enabling him to do so through a greater amplitude than he could otherwise manage.

But a nicety of judgment and an exquisite tact are required to enable the masseur to decide how much assistance is to be given, be it manual or mechanical, or by the use of gravity alone. It also requires common sense. For instance, let us take the case of a patient with a wasted deltoid who is told to raise his arm into a position of full abduction at the shoulder

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by means of a weight and pulley. It is not unusual to find that the masseur allows the patient to perform almost the entire movement with the scapula ; or, perhaps, fondly imagines that by increasing the weights the exercise to the deltoid will be increased, whereas the real effect is to render elevation of the arm more easy, while only increasing the exercise of the adductors.

If, on the other hand, the deltoid is called upon to abduct the arm in the standing position before it has adequate strength to accomplish the movement, it will frequently be found that the muscle makes no attempt to perform its hopeless task. It remains quite inert, and any movement that is accomplished is the result of scapular movement. Place the same patient fully recumbent, supporting the weight of the limb on the couch, and the deltoid will at once respond to the call for abduction by a contraction, provided that there is any continuity of nerve supply and that the patient, from desuetude, has not forgotten how to pass his voluntary impulse along the nerve to the muscle.

Another point, frequently overlooked, but worthy of the closest attention, is this : There is a universal law that if one muscle contracts, and movement of a joint takes place in consequence, some other muscle or group of muscles *must* relax. This does not mean to imply that, during contraction of a muscle, its antagonist passes into a condition of complete flaccidity. This is not so. The elongation of the antagonist is due to an active and voluntary relaxation, and the amount of the relaxation performed at any given moment is dependent on the voluntary control of the movement at the joint. Thus, if a muscle is made to contract and the joint it controls is free to move, and if movement is voluntarily prohibited, the antagonist contracts with exactly the same strength as the muscle concerned. If movement takes place as the result of muscle contraction, the antagonist voluntarily "pays out the slack," as it were, to allow the amount of movement that is required. And this it can do albeit that it is in a state of constant contraction even while visibly relaxing. The relaxation, in other words, can, in accordance with voluntary control, be negative, partial or complete. If movement is prohibited,

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as by a splint, and a muscle is called upon to contract, the antagonist may pass into a condition of complete relaxation, equivalent to that which would be allowed were full freedom of action given to the muscle contracting. If any severe effort is made, probably the whole of the muscles throughout the limb will pass into a state of contraction, including the antagonist. Let us be sure also that, when we want to assist the movement performed by one muscle, we are not merely giving a resistive movement to its antagonist.

A third consideration is of vital importance to the success of the administration of assistive movement, namely, that the dose of assistance is progressively lessened if the range of movement is unaltered. On the other hand, with increase of range of movement there should be no increase of assistance, unless the resistance to be overcome is out of proportion to the increased range.

Let us now consider in detail the various methods in which assistive movement can be administered.

The most simple has already been mentioned, namely, assistance rendered to the movement of a limb which is floating freely in a water bath. If the patient is sufficiently bad to require this treatment, it will probably be necessary to make our first movements purely passive, and then to instruct the patient to make an effort to copy, while we merely guide the movement.

The next stage is to teach the patient to perform slight movements with the assistance of gravity, then pure free movements and, finally, movements against the resistance of gravity.

When voluntary movement has been restored to this extent, assistance should not be given to such portion of the movement as can be performed voluntarily; but, as the power to complete the movement gradually fails, we commence, and equally gradually increase, the assistance given. But as our assistance is only a means to an end, it is essential that we should note the amount of assistance given on any one day, and aim to secure a similar result with a decreased amount of assistance at some definite date in the near future. The amount of improvement may indeed be infinitesimal, but still

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it should be there and should be noted, otherwise we are wasting time.

There is one exception to the rule always to allow a patient to perform a movement without aid as far as possible, and then gradually to add and increase assistance. No movement should ever be allowed, the performance of which calls forth a coarse, functional tremor in the contracting muscles. The contraction must be stopped immediately and the patient shown how to perform the movement without tremor—by first performing it for him with all the muscles in a state of active relaxation and then allowing the muscles gradually to assist. In other words, the patient assists the masseur rather than *vice versa*. If any difficulty is encountered by the patient in the performance of the contraction of any muscle, he must be shown how the corresponding muscle on the sound side contracts and then learn to copy it on the injured side.

If the impediment to movement is due to causes other than pure muscular disability the administration of movement becomes a more difficult process, owing to the fact that, almost inevitably, the muscles that oppose the movement will pass into protective spasm. Here the skill acquired in securing relaxed movements finds its greatest test in efficiency. The problem presented is how to administer what is really a forced movement. There are two ways: the first is to do it for the patient, the second to let the patient do it for himself.

To do it for the patient it is essential that, as far as possible, the movement should be performed during active relaxation of all muscles. But sooner or later the antagonists of the movement will pass into protective spasm. The closest possible watch must be kept for this reflex contraction, as it is possible to counter it, by calling on the patient voluntarily to contract the muscles which control the movement we are attempting to perform. Voluntary contraction of any muscle involves reflex relaxation of its antagonists, and this, so to speak, voluntary reflex, can overcome the involuntary protective reflex, provided that the stimulus exciting the latter is not too severe. If it is, the patient will suffer all the pain of severe cramp in both groups of muscles, and this is equivalent to the pain of the muscular spasm that follows recent fracture. Hence

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the need for care, gentleness, and tact in the performance of forced movement in the massage-room.

Another method of performing a forced movement for the patient is to accept the contraction of the antagonistic muscles as inevitable, and attempt to overcome their resistance by a very protracted, steady pull, while applying firm kneading to the whole of the area throughout which contraction can be detected. This is a slow, laborious and not over-successful scheme, and forms a very indifferent substitute for prolonged splintage with pressure or tension. If utilised, the relief of the tension must be very gradual, or great pain will be given.

One useful little scheme is worthy of record. If a patient is flexing his elbow and then straightens it, at the moment when he changes his action from flexion to extension all muscles must be uniformly relaxed. If assistance is being administered to flexion at this moment, *i.e.*, if flexion is assisted and extension resisted, the whole of our assistance is given for a short space of time during which perfect relaxation is present. By this simple expedient it is often possible to administer a considerable dose of forced movement unknown to the patient. If it is omitted, mechanical assistance to a movement, *e.g.*, by weight and pulley, possesses an incontestable advantage over manual assistance. If, however, it is kept in mind, intelligent manual assistance must always take precedence over the unintelligent mechanical assistance, save only in expenditure of skilled labour and time.

A patient can perform a forced movement for himself by utilising the force of gravity in various ways, though the most simple is, as a rule, through the medium of the body-weight. Thus the ordinary squatting, heel-raising-knee-bending exercise can secure a forced movement of flexion of the knee, provided that the patient will learn to relax his quadriceps resistance to the uttermost. As this muscle is strong enough to raise the body-weight from any position assumed during the exercise, it is plain that, in the absence of its relaxation, no forced movement of the knee is possible. Exercises on a horizontal bar can be made to perform the same function for a stiff elbow, but only under similar conditions, *viz.*, active relaxation of the brachialis anticus.

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The vital importance of securing relaxation when utilising gravity for the performance of a forced movement I have long realised. I was convinced of the fallacious nature of the teaching that the way to extend every stiff elbow, for example, was to carry weights, or to sit with the arm hanging freely over the back of a chair for some half-hour or more at a time, while grasping a heavy weight in the hand. The use of static hanging for the same purpose seemed equally to be based on an unsound principle. Rational treatment seemed to be to secure extension of the elbow by exercising the extensor (the triceps), not by stretching the flexor (brachialis anticus); and to secure flexion of the knee by strengthening the hamstrings rather than by stretching the quadriceps. I have now had occasion to examine several patients who, by their after-history, have demonstrated conclusively that this theoretical speculation is justified by fact. One example must suffice.

A military patient, who was unable completely to extend his elbow, was employed as a gardener before the war. All attempts to straighten his elbow by means of massage, weight-holding and hanging had failed. All alike were painful. It was thought that return to his employment, which, I learned, entailed considerable use of a wheelbarrow, would soon put the matter right. A few weeks later, far from being better, he could barely extend his elbow beyond a right angle. This meant a loss of movement of some 70 degrees. The whole of his brachialis anticus was hard and tender. The *raison d'être* of his loss of function was not hard to elucidate.

At a certain point in extension of the elbow pain supervened. Reflex contraction of the brachialis anticus took place to inhibit further extension the moment this point was reached. In other words, extension was checked by muscular contraction just short of the point at which further extension was painful. Thus the whole strain of the weight-bearing was taken by the brachialis anticus, which accordingly suffered from a severe dose of static contraction. This resulted in general strain of the muscle, and the next day reflex contraction took place at a slightly earlier point in extension than the day before. Daily repetition of the strain thus slowly and steadily led to increasing inability to extend the joint. The brachialis anticus was rested

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and massage was applied for a few days. The triceps was then given a steadily increasing dose of exercise, involving, of course, relaxation of the brachialis anticus, with the result that the former power of extension was quickly restored. He was then recommended to return to his work, to dig, and otherwise exercise his triceps, while avoiding strain of his flexors.

The conclusion, then, is obvious, and is drawn, not from this case alone, but from many similar experiences. When a movement is impeded by adaptive shortening and attempted increase in movement is painless, passive stretching by the use of gravity may be used as a definite curative agent. It is not, however, the best at our disposal. If, on the other hand, the movement is painful, as is usually the case when adhesions are present or when there has been septic infection, passive stretching will inevitably tend to increase the deformity unless the tension is constant (as, for instance, when elbow flexion is secured by the use of a "cuff and collar," as shown in Fig. 76, p. 150). It is the intermittent nature of the strain that is fatal to success. But if, in order to secure extension when pain is present, our correct plan of action is to train the extensor muscles, surely it is rational to suppose that this treatment will prove no less efficacious if pain is absent. And, indeed, I regard it now as a *sine quâ non* that every movement which is deficient should be restored by training the muscles that control the movement, while, at the same time, we teach the antagonists to relax instead of trying to stretch them. Even if an adhesion is present, which when stretched is the cause of pain on extension, active contraction of the extensors and relaxation of the flexors is calculated to effect the stretching of the offending band far more readily than any amount of tension that is not constant.

In the first edition of this book I was content—though with qualms—to leave unqualified the statement made above that "a patient can perform a forced movement by utilising the force of gravity in various ways," and quoted "squatting" as an example of forced flexion of the knee, and the use of a horizontal bar for that of extension of the elbow. I now believe that this was an error, and that rarely is very much gained by either expedient in the direction desired. The

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former trains the quadriceps, the latter the brachialis anticus, whereas the correct way to deal with the problem is to train the hamstrings or the triceps. I have devoted much space to the elucidation of this principle, partly, perhaps, because I formerly failed to recognise its full truth, and partly because of its bearing on all remedial gymnastics. Few medical gymnasts, so far as I know, are aware of its existence ; fewer still appreciate its importance.

Examples might be multiplied throughout the whole range of remedial and educational exercises and gymnastics.

3. *Resistive Exercises*.—The resistance may be administered by the masseur in two ways, or, as in the case of assistive exercises, the force used may be derived from mechanical apparatus, or from gravity alone. The last has already been fully dealt with, and little need be said in this connection of the use of apparatus, as the converse of the various points raised when dealing with assistive exercises by apparatus will be found to hold good.

If the masseur is supplying the resistance, a movement may be performed by the masseur while the patient resists (excentric), or by the patient while the masseur resists (concentric). It is plain that in performing the latter the amount of resistance given depends on the masseur, whereas in excentric the patient arranges the matter for himself. In concentric movement the muscle exercised shortens in length in the natural manner ; whereas in excentric movement, although contracted, the muscle may actually lengthen.

When treating a muscle during the early stages of recovery from paralysis, excentric movement should never be employed throughout the whole range of movement. But during recovery it is sometimes found that a patient is able to offer slight resistance before any actual voluntary movement can be performed, except with the assistance of gravity or in a position in which true free movement is possible. At the same time we must bear in mind that whatever tends to stretch the muscular fibres is to be deprecated. Hence the law governing treatment of this condition is that the administration of excentric resistive exercise may be performed only in the inner half of the path of contraction. This means that the movement of the part is

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limited in range to the final half of the movement that can be attained by the contraction of the muscle when in health.

Concentric movement is easy in application and of the utmost service during all the earlier stages of treatment. It is of particular importance to utilise it as early as possible, when it may take its place in the middle of a prolonged assistive movement. For instance, if the brachialis anticus is very weak, it is possible that movement from the vertical to  $30^{\circ}$  may call for assistance ; from  $30^{\circ}$  to  $60^{\circ}$  there may be enough strength to raise the forearm against the resistance of gravity. By this time the muscle is shortening and gaining in power, so it may be possible to supplement the resistance of gravity up to the right angle. Soon after, perhaps, the muscle is only strong enough to continue the movement against gravity, and lastly assistance may be required to finish the last few degrees of movement. The management of the resistance obviously requires skill and care, since it starts from negative (during the assistive stage), passes zero, rises to a maximum, passes to zero again, and finally becomes negative. In a movement of wide amplitude, such as that of full flexion and extension of the elbow, the problem is fairly simple ; but in dealing with a movement of small amplitude, such as rotation of a forearm, which perhaps is further limited by pathological change, the utmost delicacy of touch can alone suffice. But incontestably the best way of regulating resistance is to regulate by postural change the resistance afforded by gravity. Further details as to the technique will be found in the chapter dealing with the re-education of muscle (see Chapter XIX.).

## CHAPTER IX.

### THE USE OF APPARATUS FOR EXERCISE.

As we have already seen, almost every form of exercise may be classed, more or less, as an assistive or resistive exercise, and the description of mobilisation as a sequel to massage is, therefore, not complete without some account of the exercises



FIG. 49.—The first position for exercise on the sliding-seat. Foot-piece loose.

which are most frequently used as a complement to massage work.

The vast majority of Swedish exercises are commonly referred to as "free" exercises: in reality many of them depend very largely for their success on the action of gravity assisting or resisting the movements performed. For educational and remedial purposes they would be perfect were it not for two great disadvantages. The first is that it is difficult to inspire the uneducated with sufficient zeal either to master or to perform them efficiently; and the second is the difficulty of

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FIG. 50.—The last position for exercise on the sliding-seat. Foot-piece fixed and flexion of the knee assisted by the pull of the arms. It is evident that this position affords an admirable introduction to the high curtsy sitting position.



FIG. 51.—The same as Fig. 50, only showing assistance given by the patient to secure full extension.

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securing an efficient teacher. A perfect knowledge of what are commonly called Swedish Remedial Exercises does not render the teacher efficient, unless there has been at least a firm grounding in Swedish Educational Exercises.



FIG. 52.—To show the first exercise with the weight and pulley for re-educating the quadriceps. Note that this muscle is doing no active work at all, provided the weight is adequate to counteract completely that of the limb below the knee.

Unfortunately it is not universally recognised how hard it is to give good or even efficient instruction in any form of Swedish exercise, remedial or educational. The amount of knowledge, skill and tact which are essential qualifications in those who

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would gain proficiency in the art of teaching "exercises" is, as a rule, grossly under-estimated, and it must also be realised that proficiency without practice is impossible. Mere knowledge is useless, and not every one who can pass an examination can teach, though this is the essential function of a medical gymnast. The strain of the concentration required for good teaching is very great. The greatest care and discrimination should be exercised in selecting a medical gymnast, and if only medical men would familiarise themselves with the work done under the generic term of "massage" they would soon learn



FIG. 53.—Exercising the quadriceps with weight and pulley while sitting. Note that the muscle is now called upon to contract strongly.

to discriminate between good and bad, to their own great advantage as well as to that of their patients. They would also learn to accord the deep respect that is only the just due of the accomplished medical gymnast.

It is impossible not to realise that there was something very human in the old villager, who informed the doctor about to prescribe for him, "I likes summat black as stinks." So, too, there is somewhere in human nature a desire to see the result of work performed; and, especially with the uneducated, there is a sense of satisfaction in seeing a weight ascend, in response to a pull on a cord which passes over a pulley. So much is this the case, that a patient who is content to spend twenty minutes

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in the performance of this exercise will frequently refuse to spend five if requested to use a roller-towel instead!

Also it is more simple to teach patients to graduate their



FIG. 54.—To show assistive exercise for the flexors of the hip. Increase of weight gives resistive exercise for the extensors. Note that not only are certain muscles in the limb attached to the apparatus being exercised. The patient is called upon to do valuable balance work on the other limb. Hence it may well be wise to attach the sound limb to the apparatus in order to train, re-educate and exercise the injured limb.

exercises with the use of apparatus than without it, and there is, in the use of apparatus, the spirit of opposition that incites to accomplishment, which is absent in feats entailing perhaps greater skill and effort where no apparatus is used.

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But the more simple the apparatus, the better will be the result.

Few of those who are interested in massage work will fail to know the fame of Wharton Hood. His reputation for being



FIG. 55.—To show how the exercise depicted in Fig. 54 can become a resistive exercise to the extensors of the hip.

able to restore function to limbs which seemed doomed to permanent weakness was very great ; and yet his remedial agents were almost entirely confined to movements under an anæsthetic and subsequent exercise of some form or other with a weight and pulley apparatus. Some of his original apparatus is in use at the Special Surgical Hospital, Shepherd's Bush,

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and is of the most simple character. With this exception almost all the apparatus used in this hospital was built on the premises by Mr. Hobbs, carpenter to the Hammersmith Infirmary, according to the plans and directions of the author.



FIG. 56.—To show resistive exercise for the flexors of the hip. The extensors receive assistive exercise, and there is also some resistive exercise given to the quadriceps.

The main structure is depicted in the appendix. Though rather more complicated than Wharton Hood's apparatus, it remains perfectly simple, and the additions were made chiefly to meet the special requirements of a military hospital.

An attempt will be made to indicate the exercises that are

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suitable for various conditions, when later on we come to deal with each condition in turn. There are, however, certain laws which apply to all exercises.

The main point to remember in prescribing exercises is that the dose must be steadily progressive.

As an example let us consider the scheme for restoring a leg,



FIG. 57.—To show how the same exercise as that depicted in Fig. 56 can become a full resistive exercise to the extensors of the knee as well as to the flexors of the hip.

the muscles of which are wasted by disuse—let us say after an attack of typhoid, so as to exclude the necessity of considering any particular joint or muscle-group.

When his course of bed-gymnastics has been completed and he is able to get down to the massage-room, the patient starts with exercises on the sliding-seat with the rails practically horizontal. He may even have to assist flexion by the use of his hands under the rails or by the aid of the floor pulley and

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weight (see Fig. 49). Day by day the inclination of the rail is increased, the foot-piece being left loose. When the inclination can be increased no further, it is reduced and the foot-



FIG. 58.—Showing “assistive” exercise of the acromial part of the deltoid. Note the patient stands to “attention.”

piece is fixed. The inclination is then gradually increased to its maximum (see Figs. 50 and 51).

The next stage is exercise with the weight and pulley in the sitting position (see Figs. 52 and 53), then in the standing position (see Figs. 54 to 57). As it is possible with pulleys at three different levels to devise eighteen varieties of movement, each capable of two or three minor modifications, and all being

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open to at least six alterations in the weights used, it is obvious that three or four weeks can be passed with some daily addition or alteration to mark the daily progress, should such frequent change be deemed of advantage from the psychological point of view. From the purely physical standpoint it would probably serve to make several additions at once, say twice a week. Then, if the patient tires of this form of exercise, an ever-increasing portion can be replaced by exercises on the ladder.

The aim of the prescriber should be to make the alterations so trivial that the patient's muscles fail to recognise that extra strain is being put upon them, while his mind is able to note the changes that mark his progress. At the same time the alterations should be so frequent that an ever-increasing amount of exercise is performed.

Another method of recording progress, say after injury to a knee, is to mark on the rail the position to which the sliding-seat can be moved the first day. Every subsequent day an attempt is made to advance the seat, say half an inch. In a week perhaps the seat has advanced three inches, which entails a considerable amount of extra flexion in the knee-joint. Often this fact will pass unnoticed by the patient, whose attention is fixed on two small marks under his sliding-seat.

Another useful, but little-used, scheme for assisting the return of movement in a joint which has become stiff is to encourage the patient to perform some exercise with the weight and pulley or on the sliding-seat, and to assist the movement by manipulation round or near the joint at the same time. It is often of the greatest value to knead the structures which become tense as the limits of movement are reached.

In devising a scheme of exercises, not only has a steady progress to be arranged, but it is essential to make sure that we know exactly what it is we want to exercise, and to lay our plans accordingly. If a muscle, *e.g.*, the acromial portion of the deltoid, is to be exercised to its full extent, the correct plan of campaign is to ensure that it can relax and contract freely. With this object in view it is not wise to start by making it contract against resistance, but with assistance. Hence the first exercise with the weight and pulley is to allow the weight

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to abduct the arm to its full extent without any exertion on the part of the patient, while the adductors are exercised in elevating the weight during the return of the arm to the side (see Fig. 58). Although the deltoid is called upon to do no work whatever so far, its fibres are none the less shortening and lengthening with each movement. The weights are then reduced, so that to perform the movement the deltoid has to assist in raising the weight of the arm against gravity. When this can be done freely without the use of weights at all, the



FIG. 59.—The converse of Fig. 58. Here the muscle is doing a considerable amount of "work."

patient turns completely round and the weights are once more increased so as to assist adduction while resisting abduction (see Fig. 59). The patient during abduction is now experiencing concentric resistive exercise in his deltoid and excentric during adduction. Moreover, the addition of weight now increases the vigour of the exercise for the deltoid, while in the first position decrease in the weight produced the same effect.

In performing all exercises care should be taken that the patient stands strictly "to attention" throughout. General fixation of the whole body, except of the part exercised, adds

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greatly to the value of all exercises. The general rigidity of the body tends to give the contracting muscles a fixed, rather than a variable, point from which to obtain a purchase. It also ensures that the patient uses his muscles in the manner prescribed, and does not merely perform the movement "anyhow," chiefly by use of accessory muscles.



FIG. 60.—In this position the clavicular and acromial portions of the deltoid contract and relax in unison.

It sometimes happens that contraction of one muscle is a cause of pain, owing to adhesions between it and another adjacent muscle. Considering the deltoid once more, it can sometimes be noted that pure abduction and pure flexion of the shoulder both cause pain at a certain point in the muscle during the movement, which can be located between the clavicular and acromial elements. If weight and pulley

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exercises are commenced so that the limb moves in a plane mid-way between flexion and abduction, no pain is experienced (see Fig. 60). By adding an infinitesimal element of flexion and abduction alternately, it is often a simple matter to free

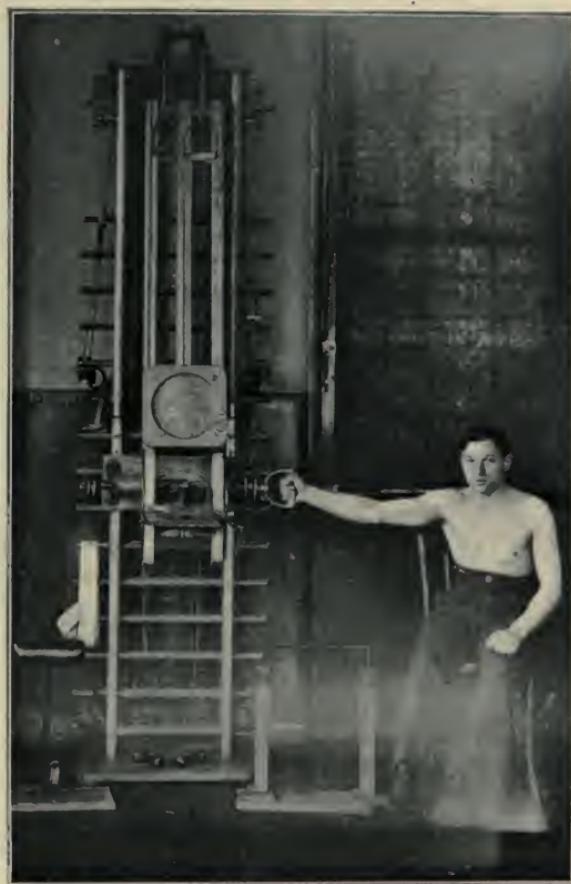


FIG. 61.—To show the position adopted when using the rotator for shoulder rotation. The apparatus here figured is built by Messrs. Spencer, Heath and George.

the offending band—an operation which cannot be performed by any amount of movement under an anæsthetic.

The ordinary weight and pulley apparatus requires to be supplemented by a roller and rotator apparatus as shown in the appendix, and it is much better that this should be controlled

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by weights rather than (as is usual) by friction. Rotation of the shoulder can be performed by seating the patient at the side of the apparatus, the handle of the roller being at the same level as that of the shoulder (see Fig. 61).

Some patients lack rotation of the forearm, and so it is difficult for them to exercise on the ladder. The detachable upright rods were supplied to the apparatus at the Special Surgical Hospital, Shepherd's Bush, to overcome this difficulty, and also to provide rigid poles for pole exercises.

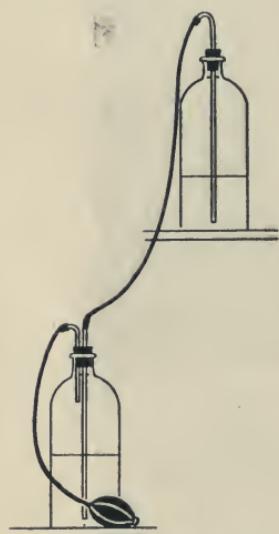


FIG. 62.—To show a simple form of apparatus devised to strengthen the grip. The upper bottle is shown in the process of being emptied into the lower by syphon action.

A nautical wheel, or a bar slung from its centre, is of great service in exercising the trunk, shoulder, and arm muscles. Resistance must be arranged by friction.

A stationary bicycle helps to develop co-ordination in the muscles of the leg. The value of this apparatus for building up muscle strength is negligible. If, in ordinary life, we wish to exercise our legs in this way, we go for bicycle rides of at least eight or ten miles. If the idea is to get into training, we should be in the saddle for several hours daily. No one can expect a patient to exercise on a stationary bicycle for the same length of time, and, if we tighten the resistance so that the exercise

is equivalent to riding up a hill, fatigue will set in so quickly that no benefit will accrue.

An ideal equipment would include an instrument for circumduction of the arm and another for the ankle. Anything that will serve to improve the grip may be added. A simple device is shown in Fig. 62. We owe its introduction to military work to Mrs. Guthrie Smith, I believe.

Given these things, there is no necessity whatever for any Zander or Pendulum apparatus. It is imposing, and perhaps

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it may add novelty to treatment ; but exercises, which cannot be devised with the apparatus previously mentioned, cannot be performed by any mechanical agency.

I have often been asked why I do not make use of Zander apparatus and whether I have any objections to urge against it. In fact, in one of the reviews given to the first edition of this book, the question was accorded a prominent position. My attitude is quite easily defined. I have only seen two fully-equipped Zander establishments at work. In January, 1916, I was one of a party of three medical men who were sent over by the British Red Cross from London to France to see and report upon the work being done amongst the wounded at the Grand Palais at Paris and at the Anglo-Belge Hospital at Rouen. The views I had preconceived of the use of a Zander installation were confirmed by both visits, namely, that there was little which could be done with the apparatus that could not be accomplished equally well, if not better, by other means of physico-therapy, provided that adequate skilled assistance was forthcoming. Then, second, it had long been fairly clear to me that, as regards the use of apparatus of all sorts in remedial work, the exact nature of the apparatus was comparatively unimportant provided that the use made of it was intelligent. Thus I believe that, to restore function, there is little or nothing to choose between the various methods which have been devised, if the patient is fully instructed in the *raison d'être* of the work he is called upon to perform.

But to restore function volitional effort on the part of the patient is the one and only final curative agent, and herein lies the chief disadvantage of all Zander apparatus. It is liable to convey to the patient the idea that the apparatus is going to effect the cure, and that all he has got to do is to allow the machine to restore him. Used in this spirit, not only Zander apparatus, but all other restorative means, are doomed to failure. Yet the Zander installation, beyond all others, it seems to me, tends to engender this spirit. I know it is not intended to do so, but the liability remains none the less. It is inevitable that, among unintelligent patients, the more elaborate is the installation the more will the patient expect the apparatus to

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accomplish for him, and the less will he suppose it is necessary to do for himself.

The last reason why I do not personally make more use of Zander apparatus is that it is perhaps the most difficult type of instrument to superintend while in use. It is almost impossible to judge how far the patient is really exerting his volitional power to secure the effect desired. In other words, it seems to set a premium, as it were, on "cheating"—be it voluntary or involuntary—on the part of the patient. The patient who blatantly sits and reads his paper while an apparatus does something to his lower limb cannot expect to derive much restoration of function. But, even putting aside such an extreme example as this, without full explanation (not of what the apparatus can do for the patient, but of how the patient is to use the apparatus for himself), the benefit bestowed cannot reach a very high level.

Contrasting the use of other forms of apparatus, the weight and pulley, again, admits of a large element of "cheating"; and, unless adequate instruction is given, it is comparatively easy for a patient to perform certain movements without calling into play the muscles they were designed to strengthen. But this fault is easy to detect, even by superficial observation, while few patients would imagine that the use of this particular type of apparatus could do much for them unless they make serious voluntary effort themselves. The very nature of Swedish apparatus precludes all idea that it will, *per se*, accomplish anything for the patient at all, and its use absolutely ensures voluntary effort in the direction desired—provided, once more, that instruction is adequate.

At St. Thomas' I have frequently made trial of a "universal" pendulum apparatus, but more and more I discard its use for the reasons given above. Used keenly and intelligently, it can achieve its end, but no more readily than, if as well as, the other means at our disposal. Were, however, trained help lacking, I can quite imagine using it more freely; but it would be done with a feeling that I was hoping for the best that some of my patients might have the intelligence to use it properly, and a conviction that those who did so would be in a minority.

The question of expense of a Zander equipment must also

## The Use of Apparatus for Exercise.

be borne in mind, and I would conclude this subject by quoting from Colonel H. E. Deane's book, *Gymnastic Treatment for Joint and Muscle Disabilities*.<sup>1</sup> In this Colonel Carless writes, *à propos* of a visit to the Grand Palais: "Whilst one appreciates the skill and ingenuity here manifest, the same feelings are again produced, viz., that the work is being done for and not by the man." Colonel Deane adds to this, as a further disadvantage, that "the use of machines is stereotyped and monotonous." The earlier pages of this book are largely devoted to the essential desirability, when attempting to restore function, of co-ordinating the activities of an injured limb to all those that are uninjured. The value of double arm or leg work and of general exercise for the whole body is emphasised again and again—a procedure well-nigh impossible with most Zander apparatus. "Indian clubs," he claims, later, "are superior to any machine"—and I fully agree; as also with his opinion that "it is pathetic to see men . . . using a pulley machine or having their limbs moved by a mechanical device, reading their letters and newspapers." After speaking of the use of assistance in various gymnastic exercises he adds: "This is in striking contrast to the deadening effect of any mechanically devised assistance which is unvarying in its operation, and affords no indication as to how much the man is doing and how much the machine."

In sum, then, the disadvantages of Zander apparatus seem to me to be:—

- (i.) It is expensive.
- (ii.) It can accomplish nothing which cannot be effected at least equally well by other means.
- (iii.) It presents a form of treatment that is least calculated to ensure volitional effort on the part of the patient.
- (iv.) It attempts to restore function of an individual joint or part by treatment confined to that joint or part alone, instead of encouraging their activities as incidents of a general treatment.

It will be noticed that little has been said in this chapter on the subject of Swedish exercises. This is not intended in any way to belittle their value. For a masseur to be thoroughly

<sup>1</sup> Oxford Medical Publications.

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efficient they must be known and studied, and may replace those suggested or may supplement them. The ideal method of treatment is to instruct the patient in the appropriate exercises in the massage-room, and to allow him to perform them elsewhere, utilising the remainder of his time for massage, and for exercises of such a nature that he cannot perform them unless aided either by the masseur or by apparatus.

It will also be noticed that reference has always been made to the weight and pulley—never to the exerciser, lest we seem to allow the introduction of an elastic exerciser; which implement, while it may be good enough to serve as a “morning refresher,” is useless for remedial work. The reason is simple. The resistance is least when power is at its greatest, and increases almost in proportion as the power of the muscle (from the posture of the limb) decreases.

The use of the terms “weight and pulley” apparatus, “ladder,” “roller and rotator,” etc., may sound rather formidable. A little ingenuity fortified by some kitchen weights, a pulley, one or at most two hooks, a chair, a stool, an iron bedstead, and a door-handle—the injured hand turns one handle while the sound hand resists or assists the turning of its fellow on the opposite side—will suffice for nearly every need. The addition of a broom-handle and an iron poker to the armamentarium is always useful.

## CHAPTER X.

### GENERAL RULES FOR MEDICAL GYMNASTS.

THE masseur is born, not made. As the pocket-knife is unsuitable for surgery, so some hands are unsuitable for massage, and no training or teaching can make them otherwise. Given the hands, the training, and the teaching, constant practice is essential to the maintenance of an efficient technique: without it the masseur "rusts" no less surely than the pianist.

Much has been written on the personal attributes to be desired in those who undertake massage work: perhaps the first is that they should have suffered illness or injury themselves, and have undergone a course of treatment. It is impossible for a person in health to realise the torture that can be inflicted by inefficient massage, and its extraordinary power of irritation, though being practised on by one's fellow-pupils during training is supposed to fill the deficiency. It does not, and massage with faulty technique must be endured after severe illness for its possibilities to be believed. The experience—referred to as hideous, torture, maddening, exhausting and so forth—is invaluable.

No great power or muscular development is required in the masseur: knack can effect more than force, and skill replaces physical strength, except when treating complaints such as obesity and fascial thickenings. For the treatment of these and similar maladies medical gymnasts should always be endowed with good physical strength. Patience is essential, and that not of the Kismet type, but of the ever-hopeful and optimistic. Sometimes it is necessary to perform our work week after week—even, it may be, year after year—with the certain knowledge that all we can hope to accomplish is to retard to the uttermost the downward path of the patient. Here optimism that refuses to acknowledge the gradual defeat may help the patient as much as, if not more than, the treat-

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ment. More and more it is becoming recognised in general medical work that the psychical side of existence must be acknowledged, and that its influence on recovery is great. In massage work this is more obvious than in most of the other branches of medical treatment ; and it is impossible, in selecting a masseur for a particular case, to ignore the personal factor. It is part of the masseur's duty to inspire the hope of getting well ; it may be, even to instil the desire to do so. Fear of disappointing the masseur has often been the sole incentive to the perseverance which has ended in recovery ; and desire to prove to a masseuse that her efforts are being successful frequently hastens recovery.

Self-assurance that is not aggressive is a valuable asset, just as timidity and lack of firmness may be the reverse.

Though introspection in a patient is never beneficial if it consists of a study of symptoms, it may be of great help if it begins and ends with attempts to note their decreasing severity and the gradual restoration of function. It is for this reason that no treatment can remain unchanged if it is to be beneficial : it must be steadily progressive, no matter how slight the progress may be, unless, indeed, the task is set merely to retard the inevitable downward passage.

Though obvious, it is well to emphasise that the masseur should never arrive at work over-heated or out of breath, and the hands, if cold, must be warmed before commencing treatment. The masseur must never be in a hurry.

The care of the hands is one of the first duties of all physico-therapists, and the lotion used at St. Thomas' Hospital is of great service. The prescription is :—

R					
Glycerini	.	.	.	.	ʒi
Pulv. Tragacanth.	.	.	.	.	ʒi
Ol. Lavandul.	.	.	.	.	m x
Aq. Dest.	.	.	.	.	ad ʒx
M. ft. Lot.					
Sig.	For the hands.				

Cold cream of the "vanishing" type is a good substitute for some skins. A fatty cream should be used at night if necessary.

In all treatments, even of the most vigorous type, the massage at the beginning and the end should be of the gentlest and most

## General Rules for Medical Gymnasts.

soothing nature, rising in *crescendo* and passing off in *diminuendo*.

Each masseur has his own favourite lubricant. The best is the simplest, namely, French chalk. This may be improved very cheaply by adding ten minims of the oil of Bergamot, or of any other volatile oil, to each pound of chalk.

Soap and water has its obvious attractions in hospital out-patient practice and is delightful to work with. In all cases of injury the patient will appreciate its use at the earliest possible moment.

Oil has its uses, particularly in softening a hard or scaly epidermis. Some masseurs seem to secure better results with oil than with powder, but it is a personal factor in most instances. The improvement in appearance after using oil is sometimes very marked, and it may add greatly to the patient's comfort. It is an undoubted fact that some oil is absorbed, but a very wide area must be treated for any real benefit to ensue. Inunctions, *e.g.*, with mercurial ointment, cannot be considered as a part of massage, and the use of thyoscyamine preparations as an adjunct to massage is, so far as my experience goes, disappointing.

To shave a part as a preliminary to massage is usually a confession of lack of skill: it should never be necessary, as even massage of a scalp well clothed with hair presents no difficulty to the skilled masseur.

The personal comfort of the patient throughout treatment is worthy of the closest study; only less so is that of the masseur. It is impossible to perform massage efficiently while cramped or in discomfort from any other cause.

As will be seen later, human life, its functions and actions, are subdued to a natural rhythm. Our object in massage being to restore function, it is obvious that we must maintain, and may perhaps assist in the restoration of, rhythm. Let us see to it, then, that our movements are rhythmical.

The responsibility for the treatment of a patient rests entirely on the medical man. The only responsibility of the masseur is to see that orders are carried out implicitly, and, if dissatisfied with the progress made as the result of the faithful performance of these orders, to report accordingly. It is a fatal mistake

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for the masseur to assume a responsibility which belongs solely to the person who recommended him as a fit and proper person to carry out his instructions. If the masseur has any suggestions to make as to alteration of treatment, or if asked by the patient to make them, the matter must always be referred to the medical man. If treatment fails, the masseur is then blameless: had the alteration been made, he would assuredly become the scape-goat. The plea "I thought you would not mind my trying so-and-so" is unavailing; and "Oh, the patient asked me to do it!" is no excuse.

Were it not for the frequency with which it is said, it would seem almost superfluous to add that the "I wonder if you have tried so-and-so" of masseur to patient is the acme of disloyalty. Also, it is no part of the masseur's duty to advise on the choice of stimulant or aperient; or to recommend remedies for headache, indigestion, flatulence, and so forth. It is disheartening to discover the frequency with which these crimes are committed. If only the masseur, who has done these things, would think of the responsibility entailed, he would, for purely selfish reasons, never do them again, putting aside all ethical considerations as to loyalty.

Massage work in this country is so largely in the hands of female workers that a mere man offers with diffidence a few further suggestions. His only excuse is that he has been particularly requested to do so.

In conversation with patients it is highly desirable to avoid professional "shop," and the masseur must always be ready with some substitute for those patients who may be talkative. A good general education is therefore a most valuable asset, but it must be backed by strenuous endeavour to keep abreast with current topics. Otherwise "shop" becomes inevitable, and indiscretions almost equally so. Education will also help to render the masseur adaptable to the surroundings as well as to the individuality of the patient, and *savoir faire* may cover a multitude of errors in other directions.

"A smiling face oft masks a breaking heart" in the masseur, but, if it does so, the patient should never be conscious of it. It is essential to be consistently the same in manner and behaviour to each individual, as nothing could be more

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distracting to a patient than to be the victim of moods or petty irritations. Also boasts of past feats are of no interest to the patient. If success attends the treatment there is no need to boast ; if it fails the boaster is stamped as a liar for all time. The necessary confidence is instilled into the patient by general demeanour and deportment rather than by the spoken word, and is dependent on the self-confidence of the masseur, which, however, must not be blatant. The disbeliever will be converted by the progress made, and not by promises.

Cheerfulness is essential, but it must be adapted to the needs of the patient. It may jar most horribly to be approached by a person with a beaming smile and a flow of chatter the day after a limb has been broken ; whereas a fortnight later these may afford the only break in the tedium of a long and wearisome day. Inquisitiveness should be kept under strict control, and all sentimentality should be banished completely from the sympathy that may be felt for the patient.

Though on dangerous soil, it may be said without offence that the dress should be inconspicuous, and preferably of some washing material. Failing this, an over-all should be worn. Bangles, rings, and bracelets should of course be barred, except perhaps a well-fitting watch-bracelet. A little stand for the watch, so that it can be stood up beside the patient's bed, is more business-like and quite inoffensive.

Training should have instilled order and system till both are ingrained and natural. Untidiness, hesitancy, or lack of system are all inimical to success. Punctuality is a virtue that should be cultivated.

Observation and the power to draw correct deductions from the observations made are all-important, and the eyes and hands should be constantly on the alert to detect every change, physical and, if possible, psychical, in the patient. To utilise aright the deductions made by constant observation, a certain amount of authority must be exercised by the masseur. Every care must be taken not to be dictatorial, but equally all trace of familiarity must be avoided. Self-respect and self-control are essential, and any departure therefrom invites lack of them on the part of the patient. Any suggestion of slackness in

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movement or posture tends to degrade the professional worker in a sick-room.

But before all comes loyalty—loyalty to the medical man and loyalty to the patient. If these should prove to be irreconcilable, it is better to throw up the case. There are few medical men who would fail to appreciate the sacrifice of a good case for adequate reason ; there are fewer still who would forgive continuation of work if such reason existed.

## CHAPTER XI.

### THE TREATMENT OF RECENT INJURY BY MOBILISATION AND MASSAGE.

JUST LUCAS-CHAMPIONNIÈRE was, during his lifetime, the most eminent champion of the use of massage in the treatment of recent injury, and his work and writings have left behind him an impression which will never be eradicated from massage technique throughout the civilised world. His chief literary effort, *Traitemenit des Fractures par le Massage et la Mobilisation*, was, unfortunately, ill named. His whole teaching was founded on the axiom of Aristotle—"Movement is life"; and far less misconception of his work would have arisen had he chosen in selecting the title for his book to reverse the order of the words "massage" and "mobilisation." This would have helped to emphasise the fact that it was written, not to extol the use of massage, but to advocate the reduction of immobilisation to the minimum. With this in view, and with this only, did he originally advocate the use of massage. Indeed, almost up to his death he valued massage little, save as a means to an end, that end being a dose of mobilisation. In all else, massage for him was an unknown power. It was only in recent years that the great master began fully to appreciate how much the effects of massage can assist recovery, even apart from the benefit conferred by the subsequent dose of mobilisation. The latter, soon after injury, is impossible without the aid of massage. None the less the treatment of recent injuries by massage is not what he taught: it was always treatment by massage *and* mobilisation that he advocated.

At the outset, then, let it be clearly understood that in treating by massage a limb which has sustained a recent injury, the massage is applied chiefly as a means of preparing the way for a dose of mobilisation.

The immediate care of all injury is in the hands of the

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surgeon, and it is rarely that the masseur has the opportunity of administering treatment before effusion has taken place in and around the damaged structure.

If fortune is kind and the aid of massage is invoked in the earliest stage, the correct method is to place the hand firmly over the injured part and apply a kneading movement slowly and patiently, the hand never relaxing its pressure sufficiently to allow any trace of haemorrhage from vessels that may have been torn. By this action we are attempting to secure a dual mechanical result, first, to prevent further effusion (be it of blood or lymph) until there is a reasonable hope that clotting in the injured vessels has taken place, or until some other means of securing the same end is enforced; and, second, to hasten the removal of any effusion that may have already made its appearance, before it has had time and opportunity to commence a process of organisation. As soon as all trace of effusion has vanished—it should only require five minutes or so to accomplish this—the part must be bandaged firmly. And herein lies a great source of danger. It is usual to apply a bandage which is almost non-resilient and which at least exerts an uneven pressure. It is almost impossible with any bandage (with most of those made it is entirely impossible) so to apply it that each turn exerts exactly the same amount of pressure as every other turn, and also so that the pressure exerted by the central part and by the two edges is identical. Any unevenness in pressure and any insufficiency of resilience alike court disaster. It should be an unalterable rule that no bandage should ever be applied with a view to the prevention or checking of subcutaneous effusion unless there is a sufficiency of padding between the skin and the bandage to ensure that neither of these risks is run. By "sufficiency" is meant anything from six to ten thicknesses of cotton-wool of the type usually sold as "surgeon's." Moreover, this pad should completely surround the injured part; and then, but then only, is it safe to apply a so-called "firm" bandage.

As soon as this has been safely accomplished we are in a position to continue treatment on the lines about to be described, only now we are using our massage as a preventative rather than a curative measure.

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To understand what we hope to do by our massage it is necessary first to realise what has happened. It will be more simple to take an actual case as a concrete example, and then to consider the various details that are applicable to other injuries. Let us suppose that a patient has stumbled and sustained a fissure fracture through the lowest inch of the radius. A fissure fracture is chosen so as to eliminate the surgical aspect of the case as regards the necessity of "setting" the fracture and any serious liability of the fragments to alter their relative positions. There has been no lateral force, the lower fragment has not moved, and therefore the periosteum will be still sufficiently intact to serve as a strong internal splint, although it may have been torn to an extent which will allow exudation of blood from the fractured surfaces.

The severity of the injury is adequate to ensure that there will be an intense teno-synovitis and that the wrist-joint will have sustained a traumatic arthritis. The ligaments of this joint will also have suffered—a few fibres of the internal lateral ligament may even have been ruptured. The inferior radio-ulnar joint will almost certainly be involved, and it is possible that the articular surface of the glenoid cavity in the shoulder may have been severely injured. For the moment we will assume that this complication has not taken place.

What has happened, then, is this, there is a fissure of the bone and there will be some extravasation of blood from the fracture. Some ligamentous fibres will have torn with similar result. There is a traumatic arthritis of at least one joint, and a teno-synovitis of the tendons of the wrist.

Taking it for granted that sufficient time has elapsed for haemorrhage to have ceased, and that immediate treatment has been carried out and diagnosis made, we know the direct result of injury, but the indirect has yet to be considered. Failing immediate and adequate treatment, this will take the form of general swelling and oedema. Some of the swelling is doubtless due to the outpouring of blood, but this is only local, and cannot possibly account for a swelling which may be intense from the finger-tips to the elbow or above.

Various explanations have been advanced as to the pathology of oedema after injury in the absence of sepsis. Local

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effusion may add to the general swelling : it does not cause it. The venous return is deprived of the assistance normally rendered by muscular contraction, but this cannot suffice to account for an intense oedema which may make its appearance in the course of a few hours. Mechanical obstruction to venous or lymphatic return might play its part in a few selected cases where fracture or dislocation has caused pressure on a main venous trunk, but the swelling may be very acute even if this possible source of trouble is wanting. Ill-applied bandages or splints will, of course, greatly aggravate the swelling by supplying the obstruction which the injury has failed to provide.

There remains one more explanation—reflex disturbance of the vaso-motor mechanism. There is evidence that this is the true cause of most of the swelling. If we consider the oedema following all fractures through the lowest inch of the radius, it will be found that, given equal severity of injury, it will be greatest in elderly or decrepit patients, least in children, and varying in severity according to age throughout the intervening periods of life. For this phenomenon there is no other explanation than that it is due to vaso-motor disturbance, which is prolonged in the aged, transitory in children, and of a duration which varies directly with the so-called "powers of recuperation" at various ages.

We are left, then, to devise a treatment for definite injuries to certain structures, and for a disorganised circulation.

Obviously we cannot heal torn fibres by massage, but we can assist in restoring the circulation on which the repair depends, and not only the repair of these fibres, but of all the various injuries that have been sustained.

Keeping in mind that the circulatory system is the curative agent, and that this has suffered reflex disorganisation, it becomes apparent that the first duty of the masseur is to counteract this inimical reflex if possible. This can be accomplished in one way only, namely, by sending up to the nerve centres stimuli calculated to procure what might be called, in contra-distinction, a beneficent reflex. In massage we have an agent that can directly assist in procuring this reflex, and in massage alone. The technique that should be followed will be clear from what has been said in the preceding chapters.

## The Treatment of Recent Injury.

The first duty is to send up to the posterior nerve roots stimuli which will procure a reflex to counteract the stimuli from the injury. This is done by slow, gentle, rhythmical stroking of the surface of the limb. From hand to elbow may suffice, but it is often necessary to make a long, straight, steady sweep from wrist to shoulder, or *vice versa*. The arm must be hanging comfortably by the side with the forearm and hand firmly supported.

It is, perhaps, not fully realised what is the origin of the spasm or cramp after fracture. The explanation of the phenomenon is simple. After fracture there is a reflex attempt on the part of the muscles to check any wider displacement of the fragments, and so prevent any further damage from being done by their movement. It follows, therefore, that spasm is least noticeable when mobility of the fragments is least, and greatest when they are freely mobile. Thus we find that it is least in greenstick and fissure fractures, and greatest when there is great displacement. Further proof is seen when sensation is lacking in a tabetic patient. Though the fragments may be freely mobile their movement does not convey to the central nervous system the call for protective spasm, as the paths along which the call must travel are blocked by disease. Hence the lack of spasm, which, as explained elsewhere, accounts for the lack of pain.

It is plain then that, if we wish to relieve spasm, postural treatment is of paramount importance. No relief can be secured, no relaxation can take place, if the posture is such that, on the cessation of the spasm, the fragments will tend to move in any direction other than that which entails their restoration to their original position. The first requisite, therefore, in dealing with any case of cramp or spasm is so to arrange the posture of the patient that, on the relaxation of the muscles taking place, no condition is present that would cause them again to pass into reflex protective contraction.

A few minutes after the treatment is begun, provided the postural treatment has been duly respected, the patient will begin to feel the pain "easing off," and the masseur notices that the forearm no longer presents the brick-like resistance to

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the hand as it passes along. A few minutes later the forearm will become as soft as the arm, and the patient will experience great relief.

It is probable that some involuntary relaxation of the fingers will be noticed as the spasm passes off. The first indication which the masseur will be able to note is the general softening of the forearm muscles. As soon as the latter are quite soft it will be found that the fingers are no longer maintained



FIG. 63.—Correct position for carrying the forearm in a sling.

rigidly fixed, and the support that they have hitherto received may be slowly and alternately withdrawn and replaced. This will impart a slight movement, which will gradually increase in amplitude. As soon as they are capable of relaxed movement through a perceptible range, the support of the hand may be so altered as to allow a slight dropping of the wrist and return to its former position. The movement, imperceptible at first, gradually increases, when a small degree of rotation may be added by slightly altering the position in which the support is re-adjusted. It is now possible to administer flexion of the

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wrist with supination, and extension up to the original position with returning pronation.

In no circumstances must extension of the wrist exceed the position in which the hand is normally held, say in the action of writing, as, if it is increased beyond this, there may be danger of tilting the lower fragment.

If, when the muscles are relaxed, there still remains a certain



FIG. 64.—Fixation of sling round the neck. The loose “tails” may be attached to a ribbon which passes round the body and is tied round the waist.

sensation of hardness under the stroking hand, it is due to oedema. It is possible for the oedema to be so soft that the simple surface stroking will send, as it were, a wave of movement throughout the whole of the soft structures of the limb. If it is apparent that these structures are not sufficiently flaccid to permit of this, despite perfect relaxation, it will be necessary to administer a dose of kneading—very gentle in character—maintaining as far as possible a definite rhythm. Spasm which does not yield to surface stroking will sometimes do so in

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response to gentle kneading. It is well to commence with the arm and then to knead for a few inches below the elbow, returning to the arm subsequently. The middle of the forearm is treated next, then the proximal part of the forearm, and then the arm once more—gradually working down the forearm towards the wrist, always emptying upwards, and always ensuring that the whole of the limb that lies proximal to the



FIG. 65.—Wrong position—though very common—of supporting the forearm in a sling. The hand is lower than the elbow.

last new portion to be treated receives its renewed dose before another more distal portion is attacked. So we go on till the neighbourhood of the fracture is reached, and this is scrupulously avoided, although the hand and fingers may receive a slight dose. The kneading may precede or follow the mobilisation, or the latter may be administered in two doses before and after the kneading. In either case the *séance* terminates with a few minutes of the surface stroking, the whole duration being

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fifteen to twenty minutes. Picking up may replace kneading whenever it is suitable.

The arm is then "done up" as the surgeon has directed; and the patient is instructed to move the fingers as much as possible, to exercise shoulder and elbow at regular intervals, to keep the hand in a sling so that it always rests at a level higher than



FIG. 66.—Correct position for using the rotator.

the elbow (see Figs. 63, 64, and 65), and on a pillow in a corresponding position at night. Massage without removal of splintage is quite possible and also very beneficial, even though the segment of the limb that has been injured is never touched.

Next day the process is repeated, slightly more movement is given, slight adduction and abduction being added; and the patient should be asked to contract all the muscles in the forearm in turn before being done up. He is now instructed

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to keep all the finger-joints loose by moving them each severally and together.

The third day relaxed movement should include some 75 per cent. of flexion of the wrist, and rotation of the forearm from full pronation to mid-way between pronation and supination. Should the latter cause difficulty, gentle kneading over the biceps and the pronator radii teres may solve it. The



FIG. 67.—Incorrect position for using the rotator.  
Note that most of the movement is performed at  
trunk and shoulder.

pronator quadratus might be expected to cause trouble, but its nerve supply corresponds so closely to that of the pronator radii teres that, if this relaxes, the quadratus will follow its example. Care must of course be taken to see that the biceps is relaxed. When the arm has been done up the patient is taught to approximate the tip of each finger to that of the thumb—"to form O's"—separating them as far as possible after each approximation. This, together with "five-finger exercises," should be done once an hour for five minutes.

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The fourth day all movements are slightly increased, but the fingers should receive a dose of almost, if not quite, complete movement, including lateralisation of all interphalangeal joints in slight flexion, and also antero-posterior movements of the heads of the metacarpals, thus moving the joints between the bases of the metacarpals and the carpo-metacarpal joints. The patient may be told to pick up a pencil and roll it between fingers and thumb, to thread large-eyed needles with thin string, and so forth.

The fifth day it may be possible to ask the patient to roll the hand to and fro on a cushion, and to raise it from a position of flexion to one of slight extension, and perhaps 50 per cent. of extension may be administered as a relaxed movement. Rotation is prescribed between the *séances* from pronation to the mid-position.

The sixth day the process is gradually increased, and on the seventh the patient may be given a pencil and told to experiment by writing his name.

And so the process goes on, day by day a little addition, till by the end of the second week full relaxed movement is possible with perhaps a few minor limitations ; while the "home exercises" include doing up buttons, filling a pipe, striking matches, and feeding ; but not cutting meat or the crust of bread.

During this second week, and perhaps even earlier, exercises on the roller and rotator are commenced, at first with no resistance, then with a daily increase of range in the elevation of gradually increasing weights (see Figs. 66, 67, and 68). The



FIG. 68.—Correct position for using the roller.

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severity of the exercise can also be varied with the size of the "grip" used on the roller. As a late exercise the ratchet may be released when the weights have been wound up to the full extent. Their return to the ground is then regulated solely by the grip on the roller. The hand works in pronation on the roller at first, and only performs supination with the rotator. As soon as three weights can be raised,



FIG. 69.—A useful exercise for securing full extension of the wrist by the aid of the ladder. The left elbow is raised and lowered.

rolling is commenced in supination, and pronation is allowed with the rotator—both without weights at first. These are gradually added as time goes on. A few days later a straight vertical pull on the weight and pulley apparatus may be allowed.

The fourth week perhaps it may be possible to add some gradually increasing ladder exercises (see Fig. 69), while the weight and pulley may be used in all directions. It is quite likely that the patient may have resumed any avocation which

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does not entail heavy work, but if greater strength is required exercises may be continued.

During the fourth week the patient may begin practising "putting," short approach shots with a mashie, swinging a tennis-racket, and so forth. An admirable exercise can be devised for rotation by grasping a steel poker in the middle and rolling it slowly round. The hand is moved daily towards one end ; the other end is then placed vertically upwards and



FIG. 70.—To illustrate an exercise for rotation of the forearm, showing how a poker may replace more elaborate apparatus.

slowly moved to and fro. While rising to the vertical this is a concentric resistive exercise, while falling from the vertical it is excentric, and may be very powerful as the grasp approaches the end of the poker (see Figs. 70 and 71).

A useful exercise during the end of the second week was shown to the author by Tait Mackenzie. It consists of taking hold of the corner of a half-sheet of newspaper and gradually crushing it up into the palm of the hand till it is all rolled up into a tight ball. The process is continued until the paper is hidden from sight as far as possible by the thumb and fingers.

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Piano-playing during the third week, typewriting, knitting, sewing, weeding, grass-cutting, and other non-laborious work all find their place as remedial agents.

Massage may cease as soon as the patient complains of weakness only and not of stiffness, and when full relaxed movement can be secured without its aid.

The tests as to how much a patient may be allowed to do are simple. If the performance of any exercise causes pain,



FIG. 71.—To illustrate an exercise for rotation of the shoulder.

it is subject to suspicion. If the pain passes off within half an hour of the hand and forearm being placed at rest in a sling, all is well. Otherwise that particular exercise is to be postponed for a few days. If any movement is found to be less in amplitude when the patient arrives for treatment than it was the day before, it is a sure sign of excessive use; while any trace of increase in swelling or of pain renders the evidence doubly conclusive. Exercises must then be stopped completely for, say, two days, or until movement is fully restored, swelling decreased, and pain relieved. Meanwhile massage and relaxed movements are recommenced and constitute the

## The Treatment of Recent Injury.

whole of the *séance*. Exercises are resumed on a slightly milder scale.

There is an anatomical law that every joint receives the same nerve supply as the muscles which control the movements of the joint. A pathological law seems to be that injury to a joint—which involves injury to its nerve supply, or at least irritation—produces a reflex wasting of the muscles controlling the movement of the joint. By following out some such scheme as has been outlined, the disturbance of circulation is restored by reflex excited by the surface stroking, by the assistance to the venous circulation, and by the reflex response to mechanical stimulation of the unstriped muscle fibres of the arterioles as a result of the kneading. The improvement in the circulation assists the repair of the joint, and, by so doing, limits the reflex wasting of the muscles.

The mobilisation effectively prevents the formation of adhesions—either general matting or definite bands. It may be argued that the minute trace of movement in the early stages can have no influence on the formation or otherwise of adhesions. This is a delusion. An adhesion in the first instance consists of granulation tissue, which is nothing more or less than a collection of minute blood-vessels the walls of which are formed by a single layer of cells. If movement is performed through the smallest possible range, it is sufficient to ensure the rupture of so delicate a structure if it tends to impede the movement. On the other hand, if natural movement only is performed, and if perfect relaxation is present, no strain is exerted on any of the normal structures, and, therefore, nothing is done that can produce the effect of rupturing the granulation tissue which is being formed for their repair. This is the only possible explanation of the results observed clinically.

How far the mobilisation tends to secure a beneficial reflex it is difficult to say, but Aristotle undoubtedly enunciated a great truth in his axiom “ movement is life,” and it may play a large part. Clinically at least the sensation of movement is most pleasing to the patient, and few natural phenomena that give a sensation of pleasure are detrimental. Moreover,

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by this means, the joint-sense is cultivated and maintained as intact as possible.

We see, then, that, in our treatment, we have aimed at restoring by massage any disturbance of circulation, and thereby have assisted the repair of all injured structures. We have, by massage, rendered movement possible, and so have prevented the formation of adhesions, without interfering with repair of the injured tissues. This, on the contrary, has been aided owing to the restoration of efficient circulation. In addition, the movement may in itself have helped to counteract the reflex set up by inimical stimuli.

The principles which underlie the gradual alteration of splintage are considered in Chapter XXXII.

## CHAPTER XII.

### THE TREATMENT OF RECENT INJURY (*continued*).

#### FRACTURES OF THE UPPER EXTREMITY.

HAVING now considered in detail the treatment of a concrete example of recent injury, and having examined into the *rationale* of the treatment, it only remains to amplify it in its application to other forms of injury.

Fractures are under the immediate care of the surgeon, and although treatment by massage and mobilisation is applicable to a very large number of fractures from the outset, it is still rarely prescribed in the earliest stages. To the author it has never seemed to be right for a medical man to pass on the responsibility of treatment till union is complete. He should at least see the patient on alternate days and examine position and splintage. He will then issue instructions to his masseur day by day.

Failing these instructions, however, it is necessary to have some guiding laws of treatment such as the following<sup>1</sup> :—

Until union is firm no form of massage is permissible over the injured segment of the limb, save only the gentle surface stroking. Even in performing this, the area of fracture must be omitted from the stroke. It is well to begin the stroking over an area that is not sensitive, and gradually to extend the length of the stroke till the site of the fracture is approached. The stroke may then be increased to include the area beyond the fracture, only the actual site of injury being omitted.

When union is complete there are various danger-signals which must always be regarded. Any increase in tenderness

<sup>1</sup> The treatment of fractures by mobilisation and massage is a vast subject, and calls for wide and varied experience, if the prescription of treatment is not to be fraught with danger. Only the barest outline can here be given, and the short sketch that follows must not be taken to represent anything but a very rough guide to essentials. No attempt is here made to enter into detail; yet it is the detail that makes for success.

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at the site of the fracture is an indication for the cessation of mobilisation and should be reported immediately. It indicates irritability of the callus due to strain at the site of union. An increase in swelling means that treatment the previous day has been excessive. The same deduction may be made if movement is more restricted or if there is an increase in stiffness. Massage is to be continued ; mobilisation reduced or omitted. Sudden onset of pain with swelling may be due to thrombosis ; it should be reported at once, and no treatment should be administered till further orders are given. The patient's life may depend on this precaution. No one could be blamed for omitting treatment on the barest suspicion of this



FIG. 72.—Position for treating a fractured clavicle with the patient supine. Note that full movement to the elbow and all joints below can be given without disturbing the site of fracture. The patient's forearm rests on that of the masseur, as shown in Fig. 25.

calamity : to overlook the symptoms is unpardonable. In addition to pain and swelling there may be a rise in temperature. The patient usually describes the pain as resembling cramp, and tenderness can be noted along a line in the long axis of the limb. If a superficial vein is implicated there will be redness, but probably there will be none if the vein lies deep.

Great care must be taken adequately to support the ends of the broken bones. A rough idea as to how this may be effected can be given shortly ; the detail requires alteration to suit the needs of each individual case.

It must be remembered that in administering a dose of mobilisation there is always one direction in which movement can be applied that will tend to displace the fragments more

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than movement in other directions ; while it is usual to find that in one direction at least movement has no tendency to cause displacement. This movement is, of course, the first to be administered and prescribed respectively during the performance of relaxed or active movement. Similarly any movement that tends to displacement is postponed until union is firm.

*Fractures of the shaft of the clavicle*, if the fragments are not liable to slip, may be treated while the patient sits with the elbow supported on a cushion. If there is any danger of displacement the patient should be supine, with head low, elbow supported by the side, and hand resting on the body (see Fig. 72). Massage should deal with the neck and pectorals before the limb is touched, but the whole limb needs treatment. Movement of hand and wrist, elbow and rotation, may all be given freely from the outset. Movement of the shoulder may be commenced very slowly and gently from the start if the fragments do not tend to shift ; if they are mobile it should be postponed for a week or ten days, and then it should be commenced very cautiously. Unless strapped, the patient should be allowed to move hand and wrist freely from the outset. A simple fracture of clavicle never fails to unite, but undue mobilisation causes an excessive formation of callus. A simple sling and a bandage is usually all the splinting that is required for any fracture of the clavicle, but the sling must be drawn up tightly under the elbow so as to take as much weight as possible off the site of fracture. Fig. 77 shows the usual type of sling employed. It may also be wise to hold the point of the shoulder back by means of a shoulder-brace (see Fig. 73).



FIG. 73.—To show the application of the shoulder-brace used when treating a fracture of clavicle in the middle third. The brace is not needed unless there is a strong tendency for the fragments to overlap.

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*Fracture of the outer or of the inner third* rarely leads to deformity, and treatment can therefore be advanced more rapidly. It is often possible to allow full "underhand" use from the outset. It is always necessary to pay special attention to the structures just above the bone; as, failing this, it is not uncommon for a piece of platysma to be caught between the fragments. This is a fertile source of subsequent pain and disability, as some fibres of the superficial cervical plexus are almost certainly involved. It can be loosened only by very slow stages and with great difficulty.

*Fractures of the acromion* should be treated on lines similar to those outlined for fractures of the clavicle. When the *body of the scapula* is broken the bony injury is of minor importance when compared with that done to other structures. There need be no fear whatever of displacing the fragments, as they are held together by the muscles and their aponeurotic attachments. Mobilisation, however, should proceed apace to the limit of pain, as otherwise dense adhesions may form and the general utility of the whole arm may thus be in jeopardy.

*A fracture of the upper third of the humerus* may be impacted. Here, as elsewhere, impaction should often be respected by the surgeon; and, if this is done, the impaction may be regarded as the first stage in repair and the limb treated as if union had just taken place. Unimpacted fractures in this situation, if treated by mobilisation and massage, usually unite about the eighth to twelfth day. By this is meant that the granulation tissue, the precursor of true callus, that is forming between the fragments has become sufficiently organised to bear the strain of ordinary relaxed movements in all directions. From this point on there should be no movements of the fragments during our manipulations. If they occur we are doing too much. The patient should always be treated sitting up, preferably on a chair, which is so arranged that he leans the opposite side of the chest on the back of the chair, supports the arm on the top of the chair-back, and rests his head on his hand. The hand of the injured arm rests in a sling or on a cushion, which is placed on the knee of the same side, this being crossed over the opposite knee (see Fig. 74). Massage is carried out as for fracture of the clavicle, but a greater area of the back

## The Treatment of Recent Injury.

should be treated so as to include the latissimus dorsi. Mobilisation is required as for fracture of the clavicle, particular attention being paid to the hand movements. It is well, unless the surgeon orders otherwise, for the patient to sleep in an armchair or lounge cane chair with the feet up, and not in bed. If he sleeps in bed, it is essential that the space between the



FIG. 74.—To show the position of patient during massage after a recent fracture through any portion of the upper two-thirds of the humerus. The weight of the limb acts as an extension. Note that the whole of the neck, chest, and back can be treated without change of position. The arm has been rotated from the position in which it rests when supported by a sling. This represents a later stage in treatment than that referred to in the text.

trunk and the limb should be well padded and that fixation should be secured adequately by flannel bandages. No movement should be given to the shoulder for eight or ten days unless specially ordered, and then all other movements should precede rotation. If ordered, slight movements, in every direction excluding rotation, may be given from the outset, provided the limb receives adequate support. Championnière

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used to say that, thanks to mobilisation, fracture of the surgical neck of the humerus might be classed as a trivial injury. Weight and pulley exercises may be commenced in a fortnight to three weeks, and full use be allowed during the fourth week. Full strength should be regained about the eighth week.

If the fracture includes *separation of the greater tuberosity*, it occasionally happens that the callus formed, or even the tuberosity itself, may impinge on the acromion during abduction. The evidence consists of sharp pain just below



FIG. 75.—To show abduction splint applied.

the acromion during passive abduction. If this is noted, the surgeon should be warned so that he may have the opportunity of placing the patient on an abduction splint (see Fig. 75), in which union is allowed to take place. This ensures that there will be little interference with the movement of abduction. For some reason or other, these fractures are always more painful than those in which the shaft of the bone only is involved. It is possible that the reason is that fracture in this position involves the sub-deltoid bursa and that we have a bursitis to deal with in addition to the fracture. I know little

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about sub-deltoid bursitis personally, but reference to it by American surgeons is not infrequent (see Chapter XXV).

*Fractures through the middle of the shaft of the bone* take a little longer to unite—about ten or fourteen days. It is easier to give movement to the shoulder after this accident than if the surgical neck is broken, but elbow movements must be much more carefully guarded.

The great danger of *fractures round the elbow-joint*, with the exception of olecranon fractures, is the subsequent formation of an excess of callus. In children this particularly applies, and all these fractures are best left alone to nature and splintage unless the danger is fully appreciated. Then, and then only, can mobilisation and massage help. The mobilisation of shoulder, wrist, and hand may be freely given. If, however, mobilisation and massage are ordered from the outset, movement may be administered to the elbow with advantage, but only if two rules are scrupulously obeyed. The first is that massage throughout the early stages should be limited to the easing of pain, and the second that mobilisation for the first two weeks must consist only of relaxed movements given very sparingly. In children this may mean that massage is reduced almost to zero from the second or third day; in adults it will require a longer dose at each sitting, and it may be necessary to continue massage for two or three weeks. After the first week, in an adult case, it will be necessary to commence gentle kneading for oedema, but great care must be taken to avoid the area of injury and to proceed so gently that not a trace of movement takes place between the fragments. Gentle frictions over the lower part of the brachialis anticus should be used whenever any effusion can be felt in this situation. Skill is required to perform the manipulation with a minimum of movement in the direction of extension. The limb will almost certainly be kept in a position that is a shade short of full flexion. It is meant to be in full flexion, but this is a very painfully cramped position and is equally difficult to secure permanently. Taking the position in which the limb is fixed as about  $30^\circ$ , the angle is increased by about  $10^\circ$  and then decreased again to the original  $30^\circ$ . This movement is performed once, and of course only after complete relaxation has

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been secured. Next day perhaps an extra  $5^{\circ}$  of extension is performed once only, and by the end of the week the angle to which the limb is extended should only reach about  $60^{\circ}$ . By the end of the next week it may perhaps reach  $150^{\circ}$ , and during the following week full extension may be given except for the last few degrees of movement. It is probable that the elbow will not be completely straightened till the end of the fourth week, or even later. It may prove necessary to apply a



FIG. 76.—To illustrate the application of one type of "cuff and collar." The straps passing over the shoulder are shortened day by day as flexion increases. Full flexion is maintained till the patient can, after loosening the straps, raise his forearm to the full extent without pain. Then the "cuff" is allowed to drop a little each day.

straight splint before the last few degrees of extension are secured at the end of six weeks. The patient may be allowed to assist flexion from the end of the second week, and to perform it voluntarily some time during the third week of treatment. Throughout the treatment of these injuries a careful watch must be kept for any increase of pain or of sensitiveness. In the event of either being detected, the indication is that the callus is "irritable," and it should therefore be regarded as an absolute contra-indication to further mobilisation until it is

## The Treatment of Recent Injury.

relieved. Rest in flexion followed by a more gradual increase in the range of movement is then undertaken.

If surgeons would only recognise the importance of bearing in mind the existence of the "carrying angle," when reducing fractures of the lower end of the humerus, many a patient would escape permanent deformity and resulting loss of function.

Except in cases of fracture of the head of the radius, rotation may be commenced early, pronation being added to the



FIG. 77.—To show flexion by a sling.

extension from about the end of the first week, with supination to assist the restoration of flexion. If the head of the radius is involved, rotation must be performed very tentatively with one exception, namely, when a fragment is broken completely off and is really little more than a loose foreign body. In this case free mobilisation is safe, but all other cases, for no very apparent reason, tend to throw out an excess of callus more readily than perhaps any other fracture in the body, not even excluding fracture of the ribs and the so-called separation of the lower

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epiphysis of the humerus. Rotation is a comparatively small movement, and if we secure 25 per cent. by the end of the first week, 50 per cent. by the end of the second, and 75 per cent. by the end of the third week, progress will have erred on the side of recklessness. And for this reason: no guide—absolutely none—will serve to show the gravity of the situation until the damage is done. Everything may seem to be going on splendidly for about eighteen days, then the patient may begin to complain of pain, and, do what we may, another week



FIG. 78.—To show how flexion may be relaxed.

will see a heart-rending reduction in movement, which may lead to permanent loss of mobility and power. Absolute rest and hot-air baths for three to six weeks will, however, occasionally avert complete disaster. The cases in which this excess of callus is most usually seen are those in which faulty diagnosis has been made. The patient has a fall, is shaken up, has some pain in his elbow (not a great deal), does his work, goes to bed and then has a bad night. Next morning there is some swelling, a medical man is consulted, movement is found to be a little painful but perfect, and there is no crepitus. Diagnosis of

## The Treatment of Recent Injury.

"sprain" is made. Hot fomentations or a liniment "to be well rubbed in" are ordered, and the patient is often advised "to keep the elbow from getting stiff." It is swollen, so he expects some pain, and it is only when he finds that the pain persists that he seeks advice again. Even the movement involved in the changing of fomentations is enough to cause an enormous outpouring of callus, so it is easy to imagine the parlous state of many of these patients. If the patient has used the arm at all after the accident, or if fomentations or "rubbing" have been advised, there is only one safe treatment—absolute rest in flexion and hot-air baths from the outset (see Figs. 76, 77, and 78). The fixation prevents the further dissemination of osteogenetic cells, the flexion ensures that any ossification that may follow will not impede flexion, while the heat causes a local hyperæmia which tends to hasten the absorption of exudate, and so reduces the amount of pathological material in which ossification can take place.

It is plain, then, that the task of the masseur when asked to treat a fracture near the elbow-joint is one of great difficulty. The main laws are "go slow" and never multiply movements till the end of the second week. It has been said above that, if trouble is arising, no guide will show the gravity of the situation till it is too late. There are, however, three symptoms which, if they arise, unerringly indicate that something is wrong—good fortune may furnish one or more. These are increase in pain, decrease in mobility, tenderness near the site of fracture. Last, but by no means of least importance, the absence of local oedema may be regarded as an assurance that no great risk is being run, while its presence should fill us with suspicion. Local oedema in front of the elbow, if present, usually indicates blood-clot. If the newly-formed callus is irritated, the whole of this clot will ossify; and if, as often happens, it should run into the interstices of the muscle fibres, opened up by tearing of the sheath of the muscle by the broken fragments of bone, it will lead to a condition closely resembling myositis ossificans—usually in the brachialis anticus. If there is no local oedema there cannot be any large amount of extravasated blood, and hence ossification outside the bone, even if it does take place, is not likely to be excessive. Let us beware then of local oedema.

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There is one form of fracture of the humerus near the elbow after which no fear of excessive callus formation need be entertained. This is a T-shaped fracture into the joint. The synovial fluid, it would seem, escapes from the joint between the fragments, acts thus as a foreign body, and inhibits the growth of callus. Unless mobilisation is administered with a somewhat free hand, it is no uncommon event to find non-union as a sequel to the accident. The mobilisation tends to counteract the inhibitory action of the synovial fluid. As already stated, the same applies to fractures of the head of the radius where a comparatively large fragment has been broken clean off.

One more pitfall. It is difficult to explain how an elbow can be dislocated backwards without fracture being coincident. It appears, however, that it is possible. Even without dislocation, and even if radiography can produce no evidence of fracture, any severe injury near the elbow is liable to produce an outpouring of callus from somewhere, or, if not of true callus, of a deposit which develops into new bone. Treatment of these injuries should therefore be very cautious.

When speaking of relaxed movements great stress was laid upon the necessity of paying due regard to the laws which govern their administration. If there is one condition in which this is more essential than in others, it is when we are called upon to treat any severe injury in the neighbourhood of the elbow. It is not infrequent to hear these cases cited as examples to show the great damage that can be done by "passive" movement. When the accusation is examined carefully the story is always the same. The masseur, finding movement rather limited, forces the movement in the desired direction. The result is disaster. He has been guilty of substituting "forced" movement for "passive," and the irretrievable harm done is not due to "passive" movement. Nor is it due, as is sometimes stated, to an excess of zeal. It is due to nothing more or less than gross ignorance—ignorance of the elements of the treatment of recent injury, and of the nature of passive movement.

*Fractures of the olecranon* may be complete or incomplete. In the latter case the un torn periosteum will form an efficient splint, strengthened as it is by fibres from the insertion of the triceps. Nothing need be feared from the bony injury, and so

## The Treatment of Recent Injury.

the only condition that calls for treatment is the arthritis of the elbow-joint. This may be treated on lines similar to those sketched out for treatment of a fracture through the lowest inch of the radius without displacement. Roughly speaking, massage for the relief of pain—superficial stroking only—is given to restore the tone of the vaso-motor system of the limb and to relieve spasm. From the outset full relaxed movements of hand, wrist, and shoulder are given, and some 30 per cent. of elbow movement. Free active movements of hand and of the shoulder below the horizontal plane are prescribed, provided that no pushing or pressing is allowed. Relaxed and active movements proceed regularly day by day, guided in extent by the amount that can be performed without pain.

If the fracture is complete, and the smaller fragment of the olecranon is drawn up by the spasm of the triceps, few surgeons can be found who would recommend massage from the outset. Lucas-Championnière, who was the first surgeon to operate on these fractures in France, gradually came to the conclusion that the results attainable by mobilisation and massage were so superior to those following operation that he abandoned the latter altogether in favour of the former. A few cases are still recommended for massage from the outset for patients who are unsuited temperamentally or physically for operation, and an excellent result may be assured provided that the masseur and the patient fully appreciate one fact. Union will not be sufficiently firm to support any serious degree of tension for four weeks. Therefore, during this period, anything that pertains to the nature of "overhand" movement must be prohibited. With this reservation the treatment may be conducted on somewhat free lines. From the outset the aim of the masseur should be to secure by gradual stages relaxed movement from  $90^{\circ}$  to  $170^{\circ}$  of extension. After ten days or so, the sole guide being the painless nature of the movement, any "under-hand" use of the hand may be encouraged, but again no pushing or pressing downward with the hand, *e.g.*, cutting bread or meat. After this stage has been reached flexion may be increased till the movement is complete about the end of the third week. As no "over-hand" movement is to be performed for so long a time, great care must be taken

## Massage.

to retain the suppleness of the shoulder and the strength of the deltoid by relaxed movements and static muscle contraction.

*Fractures of one bone of the forearm present*, as a rule, little difficulty. Union of the lower end of the radius or of the upper third of the ulna is usually firm enough to allow great freedom of relaxed movement in eight or ten days, and active movement may almost always be indulged in with ever-increasing freedom from the end of the fortnight, provided it is painless and no swelling or tenderness follows use.

As the site of fracture ascends the radius or descends the ulna the time required for union to take place increases steadily, till a maximum is reached for the lowest inch of the ulna, where a fracture frequently requires some three weeks to unite.

*Fractures of both bones of the forearm* are the *bête noir* of all methods of treatment. After operation they frequently fail to unite, the same fate often awaits the use of ordinary splintage, while treatment by mobilisation is sometimes not much more satisfactory. Certain it is that great risk is involved by those who are unfortunate enough to sustain this injury. Until union is complete in *both* bones the main function of the masseur is to attend to the circulation of the arm, and to see that the fingers remain supple. One of the most efficient methods of applying splintage is to fix one splint from shoulder to finger-tips posteriorly and another from wrist to shoulder anteriorly (see Fig. 79). In applying the splints it is essential to note that the "carrying angle" is maintained. This entails the use of a very broad or suitably bent posterior splint. Massage of the forearm should only be applied with the posterior splint *in situ*, the patient being fully recumbent and the shoulder



FIG. 79.—To show the application of long anterior and posterior forearm splints. The posterior splint is bent so as to allow for the "carrying angle."

use of a very broad or suitably bent posterior splint. Massage of the forearm should only be applied with the posterior splint *in situ*, the patient being fully recumbent and the shoulder

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abducted to about 45°. The patient must remain in bed with the limb elevated on a pillow between treatments. This method of splintage produces an appearance in the limb that would seem to be deplorable, and the restoration of movement is very troublesome unless performed in one way. Commence with slight pronation of the forearm, and flexion of the elbow follows naturally: attempt flexion without this preliminary, and endless trouble will ensue. In treatment of these fractures it is more essential perhaps than in any other case, medical or



FIG. 80.—To show the method of reducing a Colles' fracture practised by Sir Robert Jones. By this means it is often possible to reduce deformity a very considerable time after fracture has taken place. No further damage is done to the already seriously injured tendons, tendon-sheaths and ligaments.

surgical, to insist that the whole responsibility should rest on the medical man. When union is nearing completion the forearm may be allowed to rest at a right angle across the chest, where at first it is slung in supination, as shown in Fig. 158.

A very full account has been given in the previous chapter of the treatment applicable to a simple *fracture through the lowest inch of the radius* without displacement. If there is displacement, or if it has been present and has been reduced, treatment must follow the same lines, but progress should be somewhat slower at the outset. The vital importance of

## Massage.

reduction of gross deformity is frequently overlooked. The best way to effect it is shown in Fig. 80. Whenever possible impaction should be respected, and regarded as the first stage in repair. Impaction and severe displacement rarely occur simultaneously. In these cases pain over the styloid process of the ulna will be a source of great trouble to patient and masseur alike, so local treatment of the internal lateral ligament should always find a very definite place in the *séance* from the first, even though the patient may not complain of pain there for some time after the commencement of treatment. Local



FIG. 81.—To show the administration of local treatment to the internal lateral ligament of the wrist-joint.

kneading and friction are called for, and it is important that these should be administered in every position from full pronation through all the stages of supination as they are day by day secured (see Fig. 81). The importance of loosening all the joints in the neighbourhood of the head of the ulna is dealt with later (see p. 220).

*Fractures of the carpus* with displacement must be dealt with by the surgeon: after operation, or if there is no displacement, treatment should follow the lines laid down for fractures through the lowest inch of the radius. Fractures of the scaphoid in particular should receive a free dose of mobilisation from the outset whenever there is any reason to suppose that synovial

## The Treatment of Recent Injury.

fluid has leaked in between the fragments. This treatment adds greatly to the chance of satisfactory union taking place.

In all cases of carpal fractures it is wise to splint the hand in dorsi-flexion. If this movement is limited by bony deformity, operation should be considered.

*Fractures in the hand* call for treatment on general lines. The long bones of the hand are concave on their palmar surface, and therefore flat splints with full extension of the fingers tend to produce a palmar convexity at the site of fracture. If surgeons would recognise this fact, many hours of labour would be saved for the masseur, and many hands would be perfectly sound which are now doomed to permanent incapacity, of greater or less degree, despite endless work in the massage departments of our hospitals. A pad of wool or dressing about the size of an ordinary tennis-ball forms an efficient splint. It need not be spherical—the “tennis-ball” in fact should not be fully inflated. It may be well to emphasise that for fractures involving the hand, no less than for similar injuries in other portions of the limb, massage to improve the circulation is one of the chief agents by which repair may be hastened, and therefore that treatment of the arm is just as important as treatment nearer the site of fracture. Were these hand fractures treated more regularly by mobilisation than is at present the case there would be fewer cases of ununited fracture of the metacarpals, and many an operation—only too often unsatisfactory in the end—would be obviated.

## CHAPTER XIII.

### THE TREATMENT OF RECENT INJURY (*continued*).

#### FRACTURES OF THE LOWER EXTREMITY.

*Fractures of the Neck of the Femur.*—When speaking of elderly patients who have sustained an impacted fracture of the neck of the femur, Lucas-Championnière was always emphatic that more people die as the result of treatment by immobilisation than of the injury. When undertaking treatment by mobilisation and massage it is essential to remember that, if the patient is one of advancing years, the reflex arc is very soon and very easily tired. Hence massage must be reduced, as in children, to a minimum ; while mobilisation takes a part in the treatment of these fractures that nothing can replace. It is surprising to find how much movement can be administered, after a few minutes of gentle stroking, to a limb that is held absolutely fixed and rigid by muscular spasm. The relief of the movement is very great : it indicates the subsidence of the cramp and its accompanying pain. It is usual for these fractures to be impacted, and the following remarks are based on the assumption that impaction has taken place.

Massage should begin with surface stroking from hip to foot. In a few minutes the free hand will find that the toes can be moved without pain, a little later the ankle begins to move, and as soon as this has received a fairly full dose of mobilisation attention may be given to the knee. The disengaged hand is placed under the knee, and the most gentle attempt is made to elevate it and to let it fall again every time the massaging hand passes over it. No movement will take place at first, but before long it will be felt. As soon as it has been raised sufficiently a pillow is placed beneath the knee, and then flexion and extension may be performed by supporting the ankle (see Fig. 82). In ten minutes or so foot, ankle, and knee may have

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been mobilised freely, and this of necessity entails some movement of the hip. If all has gone well so far, the hand under the ankle may now raise the leg, and support is given as shown in Fig. 35, p. 77. All movements of the hip should now be performed slowly and carefully, care being taken while giving internal rotation, as this movement invariably causes pain. In fact, the patient is unlikely ever again to be able to perform this movement, owing to the external rotation of the shaft in its relation to the head of the bone. The limb is next placed at rest, very slightly bent over a cushion, and the patient is instructed to attempt various movements of the trunk, commencing with raising the shoulders and gentle turning move-



FIG. 82.—To show another method of mobilising the knee during the early stages. The right hand of the masseur alternately raises and lowers the foot.

ments. Any pain that these may cause may be relieved in a few moments by massage. Following this routine it should be possible to sit the patient up in bed for short intervals on the second day and to get her—the accident usually occurs in women—on to a chair or couch (keeping the limb horizontal) on the third day. The foot may be allowed to hang down in a week, and it is possible to plan a multitude of simple devices to encourage the full restoration of the movements. Some patients can walk immediately after the accident—it is not uncommon for them to do so, as the intensity of the pain is lost for the moment in the shock of the accident—and it is not till later that their real suffering commences. Thus the patient may be encouraged to stand on the sound leg and swing the injured limb gently to and fro, and slowly to carry out the plan

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for restoration of function mapped out in the chapter on the re-education in walking.

If there is no impaction, splintage with extension is required. Treatment by mobilisation and massage may still be carried out with benefit, provided that the extension is applied on any



FIG. 83.—To show the administration of a dose of relaxed movement to the knee-joint of a patient with fractured femur, before union is firm enough to allow removal of the extension. It was in this manner that treatment was given to the patient shown in Figs. 86 and 87 on and after the tenth day from the receipt of a septic "G.S.W." of middle third of the shaft of the femur. The ordinary surgical treatment of the wound, drainage, irrigation, subsequent sequestrotomy, etc., was carried out concurrently.

system other than that of the Hodgen type. The method of administering a dose of relaxed movement to the knee of a patient who has been put up in a Thomas' knee-splint is shown in Fig. 83. It is possible, when the splint is slung from an overhead support, to perform the manipulations single-handed, but the difficulties are considerable and the strain is great. The assistant raises the end of the splint; the masseur then

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loosens the sling which supports the limb just below the level of the knee-joint. He now grasps the limb firmly below the knee-joint, and receives the weight of the limb on to his forearm as each successive sling towards the ankle is released. It is essential that the next sling above the knee should be in close proximity to it and should adequately support the lower part of the thigh. The assistant then loosens the extension. The masseur, skilled in the treatment of recent injury and in the administration of relaxed movement, is now able to give a dose of mobilisation while still exerting powerful extension on the lower fragment of the broken femur *via* the knee-joint. On completion of the relaxed movement the assistant refixes the extension before the masseur adjusts the slings. For accuracy extension and slings may be marked, if this precaution seems desirable.

It is sometimes urged that this treatment cannot fail to impede union and to allow movement of the fragments and the return of deformity. The limited movement will assist in formation of callus, and, as regards the second assertion, the only effect on the fragments is that the masseur, by his grip, transforms the tension on the fragments into that employed when a Hodgen splint is used. Far from disturbing the position of the fragments, his manipulations render possible a painless reduction of deformity. By these means it is often possible to secure a muscular relaxation which assists restoration of outline of the bone more readily than any other means short of open operation. Photographs of two patients who sustained gunshot wounds of femur, and who were treated on the lines indicated, are shown in Figs. 84 to 87.

The surgeon who lacks the requisite assistance or the temerity to undertake this treatment in person need not withhold all physical treatment. Much may be done without mobilisation of the knee in the early stages. Thus an attempt, with considerable hope of success, can be made to keep the muscles from becoming adherent to the bone at the site of fracture by means of graduated faradic contraction. The patella can be kept comparatively mobile, and stroking of the whole limb and movement of toes and foot-joints should be performed during

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FIG. 84.—This and the subsequent photo were taken of a patient before discharge from the Special Surgical Hospital, Shepherd's Bush. He sustained the ordinary septic "G.S.W." of femur on August 24th, 1918. He was treated on a Thomas' knee splint. Massage and relaxed movements were begun on September 21st. Flexion through  $55^{\circ}$  was secured by the middle of October. A month later he was taken off individual treatment and placed in a special class for exercise without weight, and by the 25th November his knee could be bent to a right angle. The muscular development and power is shown in Fig. 85.



FIG. 85.—Same patient as that shown in Fig. 84. Note the power of full extension of the knee and general "good condition." Photo taken (about) March 3rd, 1919. There was no visible deformity or shortening.

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FIG. 86.—The second of seven cases who were taken off individual massage treatment, and treated thenceforth in a "special class" for exercise within three months of sustaining septic gunshot wounds of the femur. History :—

" G.S.W. " . . . . .	September 2nd, 1918.
Massage and movements . . . . .	September 12th, 1918.
Started use of sliding seat . . . . .	October 30th, 1918.
Special class . . . . .	November 26th, 1918.
Sequestrotomy : : .	January 29th, 1919.
Photo (about) : : .	March 3rd, 1919.



FIG. 87.—The same patient as that shown in Fig. 86. The photos were taken about six months after receipt of wound. Treatment began in both cases shown while the "through and through" wounds were widely open. The cases were kindly sent to me for treatment by Mr. Trethowan.

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the early stages. The ankle may be moved if the appliance permits. No other massage movement need be given till union is complete. In septic compound fractures union is often delayed, callus formation is sluggish, circulation very faulty, and oedema equally intense. Great benefit can be bestowed in these cases by kneading. Every movement will tend to shake the fragments, and it is necessary, therefore, that great care and gentleness should be exercised, and that any pressure exerted, however slight, should find something to counteract it on the other side of the limb. If necessary this must be one of the masseur's hands. Granted these requisites, the movement of the fragments will stimulate the callus and hasten recovery; excess will delay and even prevent union. The question of restoring function and regulation of splintage is considered in Chapter XXXII.

The same remarks apply to all *fractures of the femur below the neck*. Any movement is prescribed by the surgeon, though it were well if, in recent fractures, he would always try the effect of mobilisation under the influence of massage before deciding on open operation for the reduction of deformity. When union is complete and the patient is handed over to the masseur for restoration of function, the first attempts at movement should always be performed so as to ensure that no strain falls upon the site of fracture. At first any strain exerted should be in the line of the long axis of the limb, lateral strain being added by very slow stages. A Thomas' knee-splint is the most suitable splint on which the limb can be put up, if we wish to apply massage to any case of fracture of the shaft of the femur.

As already indicated, treatment by mobilisation is considerably hampered by any form of splintage which requires the body-weight as an extension. Under these circumstances the knee must be kept immobile until such a time as union is complete. Much has been written about, and the strongest advocacy has been given to, the use of calliper extension, the traction usually acting from the condyles of the femur. My experience of the after-results of these cases is that full extension is seldom secured while the calliper is in place (see Fig. 88), and a knee that lacks the last  $10^{\circ}$  of full extension is a poor

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thing at best. Far more useful is full extension, even at the expense of a loss of the possibilities in flexion.

The best restoration in outline of the shape of a broken femur is usually secured by open operation, but the cases that show such excellent alignment after operation are just those which tend to present insuperable difficulties in adjustment when other means are tried. On the other hand, when operation is rendered difficult owing to comminution, treatment by mobilisa-



FIG. 88.—To show the application of a common form of calliper extension as applied to a fractured femur. Note that full extension of the knee is impossible, as the top of the shin meets the cross of the calliper before this position is reached.

tion yields its most satisfactory results in restoring the contour of the bone.

In sum, then, if it is possible to reduce the deformity without operation, treatment by mobilisation and massage offers the best chance of exact restoration ; it hastens the formation of callus and, therefore, the restoration of weight-bearing functions ; and it maintains more nearly intact the mobility of the joints, the muscular power and co-ordination, than any other method of treatment. But, even if full treatment is withheld, at least let us be sure of this : better it is to have a short leg and a sound foot than a perfect leg and a painful foot. In other

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words, in all cases of fractured femur let us remember that we are treating a patient and not merely a bone, and that it is our duty, as far as in us lies, to let no portion of our patient suffer from neglect. The toes, foot, ankle and patella should never be overlooked. It is often well to remember that the patient has two legs !.

The remarks made on the inhibitory action of synovial fluid on callus formation, after fractures of the humerus into the elbow-joint, apply with equal force to those involving the knee-



FIG. 89.—To show how a leg may be raised from a posterior gutter splint by means of a "cradle" of lint before union is consolidated.

joint. Early mobilisation is advantageous, and only requires the most careful graduation.

After any *fracture of the leg*, massage of the thigh can be used to restore the vaso-motor tone by reflex, and to assist the circulation by its mechanical effect and by toning up the muscles of the arterioles. Hence great benefit can be bestowed, although the leg itself may be fixed in plaster. If massage is ordered after *fracture of the fibula* above its lower third, the treatment may proceed without fear of displacement. Surface stroking of the whole limb is followed by general massage of the thigh, and movement is given to all joints, with the exception of eversion of the foot. Movement must be carefully

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supervised by the surgeon till union, which often takes place rapidly, is complete.

The same remarks apply to *fracture of the tibia alone*, but movements must be much more guarded, varying from comparative freedom, corresponding to that usually applicable to fracture of the fibula, to the almost negative amount that it is possible to apply if both bones are broken. The best guide is to be found in the amount of tearing of the natural internal splint—the periosteum—and this can only be estimated by the mobility of the fragments, which in turn is indicated by the amount of displacement after accident. If there was little displacement, the graduation may be rapid ; if great, mobilisation must be reduced accordingly.

If the *shafts of both bones* are broken, great care must be exercised in the earlier stages. Until union is complete the splint must be either incomplete or one that is easily removable without disturbing the fracture. If there is small chance of the fragments moving out of place, it usually suffices to place the limb in a posterior gutter plaster of Paris splint (see Fig. 89). The limb rests on a sheet of lint which is not attached to the splint. By means of this the limb can be lifted from the splint without any fear of disturbing the fragments. It is then rested on a suitable support and treatment is given, care being taken to see that the original position of the foot is maintained throughout treatment. Hence the importance of the grip of the left hand as shown in Figs. 5, 6, and 7, pp. 28—30. Stroking of the whole limb may be given first, then the limb is replaced in the splint and gentle kneading of the thigh follows. The treatment terminates with movement of the toes. When union is complete—it is more rapid towards the upper end of the tibia than towards the lower—knee and hip movements may be commenced gradually, though great care must be taken to avoid any transverse strain being placed on the site of fracture. The limb is then placed at rest and the ankle is mobilised separately. At the earliest opportunity the patient is allowed to swing the leg over the side of the bed, and re-education in walking is commenced (see Chapter XX.). This should be about five days after union is complete, *i.e.*, probably during the third week.

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If the fragments are freely mobile splintage is arranged on somewhat different lines. The patient is anæsthetised, and the gutter splint is moulded as before, and is then fixed *in situ* by a circular bandage. The advantage of this method is that the bones can be moulded into position in the gutter splint while we are still able to check their position by sight and touch. Only when the fragments are adjusted to our satisfaction do we finally enclose the limb. After a few days the circular plaster can be cut off without disturbing the original gutter.

After *fracture in the region of the ankle-joint* treatment by mobilisation and massage is often of the greatest possible service. After *fracture of the lower end of the fibula*, assuming that there is no displacement and that immediate treatment is called for, the first point is to see that kneading is performed over the external lateral ligament with sufficient firmness to arrest haemorrhage if this is obviously progressing, and to remove any effusion that may have already taken place. A thick pad of wool is then applied, and the whole is tightly bandaged. If, however, treatment commences at a later date, surface stroking massage should be commenced from about the middle of the calf to the hip, and the region of the ankle is gradually approached. Presently the stroke begins on the dorsum of the foot, it skips the ankle region, and then is continued up the limb. Any area of local swelling over the external lateral ligament is next subjected to firm kneading to try to dissipate local effusion. Care must be taken to avoid the site of fracture. In any case local treatment is called for over the ligament, unless there is some definite contra-indication. All movements, minute in amplitude at first, are administered to all joints of the foot, with the exception of eversion, and to the ankle. The second day deep stroking and compression massage of the thigh, and perhaps of the calf, may be added ; and the third day the patient may hang the foot down and begin to move it about gently at the end of treatment. As soon as all swelling has disappeared—usually about the eighth day—exercises without weight and general re-education may be begun.

Treatment for *fracture of the internal malleolus* should follow similar lines. The fracture is one which is commonly stated to

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fail to unite. This is probably due to the escape of synovial fluid between the fragments, and mobilisation affords us a potent weapon wherewith to counteract this tendency. Eversion and inversion should not be prescribed at first, but all the other co-ordination exercises without weight (see Chapter XX.) should be hurried on apace. After fracture of either malleolus without displacement it is usually unwise for the patient to bear weight on the injured limb for three weeks, when he may begin to do so gradually, though another week or more may be required before he is able to walk. Sometimes freedom cannot be allowed for six weeks. The only way to judge how rapidly treatment may advance is to go by very gradual stages and watch for increase of pain or swelling or decrease in mobility. If any of these occur we must retard treatment ; if they are absent we can continue our advance.

If *both bones are broken*, or if there has been dislocation of the foot combined with fracture of one or both of the bones, treatment is much more difficult. The surgeon must reduce the deformity and arrange some fixation apparatus. Massage of the thigh can, none the less, aid repair by acting on the circulation and the nervous mechanism. When the splints are removed, care must be taken always to maintain inversion of the foot until union is quite sound, *i.e.*, for a fortnight at least.

If a patient is found in a box-splint without a vertical foot-piece, then let the masseur beware. There is no more potent cause of thrombosis in the posterior tibial vein than the omission of the foot-piece. A glance at Fig. 1 will show that, if the foot is allowed to drop, the calf muscles flatten out, and the vein must accordingly be obliterated (see p. 15).

*Fractures of the tarsal bones* are serious injuries, and are often the prelude to osteo-arthritis in the joints. The patient is then in a parlous state. Treatment by mobilisation and massage tends to avert this evil ; but the administration of movement is often impracticable during the early stages.

*Fractures of the metatarsals*, accidental or operative—as, for instance, after operation for hallux rigidus or valgus, when the bone has been completely divided—always provide a certain anxiety for the masseur. The severity of the injury varies, fracture of the first metatarsal being the most injurious, that

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of the fifth being least so. Mobilisation after massage must be given with all possible freedom to all the joints where movement does not involve any danger of displacing the fragments (see Fig. 90). When these are united, in about three weeks, all that remains is re-education in walking, which is preceded by free movement of all the joints of the limb. The patient, as a rule, is not able to walk freely for about six weeks.

*Fractures of the patella* are of two varieties—the stellate and the transverse. In the former the periosteum, with its streng-



FIG. 90.—To show a useful grip for mobilisation of the tarsal and tarso-metatarsal joints. Kneading the foot without allowing the hands to slip over the surface of the skin may be performed in the same position.

thening fibres derived from the quadriceps and patellar ligament, is not ruptured and acts as a most efficient splint. Treatment should therefore be on the lines of a recent sprain to the knee-joint. If the fracture is complete and the fragments are widely separated, treatment by mobilisation and massage cannot quickly ensure any excellent result. Lucas-Championnière advised that, in all these fractures, the fragments should be united by suture. Plates are not so satisfactory, as they do not permit of any moulding or subsequent adaptation of the fragments. Then, if the shape of the bone is not perfect,

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refracture is almost a certainty. Robert Jones in his *Injuries to Joints* records that admirable results follow the use of the walking calliper for this accident. Massage could assist to maintain the nutrition of the limb and thus hasten repair, while mobilisation could be administered without fear of stretching the fibrous union, at least from a point half-way through the period that the instrument must be worn, which is about two months. The manner in which reduction of splintage should be adjusted is indicated in Chapter XXXII.

Efficient re-education in walking is a very special art, and is invariably required to a greater or less extent after all fractures of the lower limb (see Chapter XX.).

Before leaving the subject of fractures it is necessary to utter a word of warning. Not every masseur is a fit person to be entrusted with the responsibility of treating a recent injury. If fracture is present, only those who have received special teaching and training in the art should be asked to deal with it, and, even then, great care and discrimination are called for in selecting a masseur for a difficult case. Experience alone is inadequate in the absence of the necessary skill and temperament. To hand over a case of recent fracture to a masseur merely because he happens to be proficient in other branches of his work is to court disaster. The responsibility for failure belongs to the medical man who selected the masseur, so it is his duty to be sure that the latter is qualified—by training, experience, skill, and temperament—for his highly specialised and very responsible duty. For the treatment of recent injury is an art apart. Under no circumstances can the medical man shift his responsibility for the position in which the fragments unite. If the result in this respect is faulty, he alone is to blame, as it was his duty to watch the position and correct errors while there was yet opportunity.

## CHAPTER XIV.

### THE TREATMENT OF RECENT INJURY (*continued*).

#### SPRAINS AND DISLOCATIONS.

A DISLOCATION, once it has been reduced, is only a severe form of sprain. The historical treatment of these injuries is prolonged rest with absolute fixation. This treatment ignores two facts. First, that to repair injury done an efficient blood supply is essential : by absolute rest the circulation in the part is reduced to a minimum, and this is all the more pernicious on account of the vaso-motor disturbance due to the injury. Second, in all these injuries one or more joints have suffered, and the muscles which control the movement of the joints undergo a rapid wasting, due to a reflex set up in the joint which derives its nerve supply from the same source as do the muscles. By immobilisation nothing is done to counteract this wasting. Of recent years there has been a marked tendency to reduce the period of immobilisation considerably, and it is now no uncommon event for a case of dislocation to be recommended for mobilisation and massage from the outset.

The treatment of recent sprains and dislocations is very similar to that prescribed for any case of fracture in the vicinity; the only differences being that special muscle groups usually call for extra attention in devising treatment, and that treatment can progress more rapidly.

After dislocation there is always spasm of the muscles controlling the joint. This is a reflex attempt on the part of the muscles to prevent the bone slipping any further. In other words, it is nature's method of attempting to secure the immobilisation of a structure which is no longer in its normal position. Once the dislocation is reduced the need for this protective reflex is diminished, being now only necessary in so

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far as it is called for to prevent undue movement in a joint which is suffering from a severe traumatic arthritis. Thus the dislocation, when reduced, amounts to nothing more than a sprain of sufficient severity to tear one or more ligaments.

The masseur will never be called upon to treat a case of dislocation until it is reduced. Many medical men would be surprised at the ease with which some dislocations can be reduced spontaneously after massage has been performed for only a few minutes. This particularly applies to dislocations of the shoulder.

The general indications for treatment after dislocation will be plain from what has been said in the previous chapters, and all that is necessary is a short recapitulation.

For the relief of pain and of such spasm as may be present (after reduction in the case of dislocations, or after the ordinary manipulation performed for diagnostic purposes in the event of sprains) surface stroking is the one thing needful. The limb must be maintained in a position of perfect ease and comfort, and therefore in one which does not tend to recurrence of dislocation, or to the stretching of any ligaments that may have been injured.

The stroking also tends to counteract any inimical stimuli set up by the injury, and so helps to restore the vaso-motor tone and to prevent muscle wasting. How far these two results are interdependent it is impossible to say.

Deep stroking may be used at once as a further aid to the circulation, and any form of compression massage may be added for local treatment wherever it seems to be indicated, as an aid to the removal of local effusion before it has had time to organise. It will be remembered that this is the first care of the masseur if immediate treatment of a sprain is demanded, and then it is given with the additional motive of stopping haemorrhage from any vessel that may have been torn. The kneading in this event is to be followed by pressure by means of a *thick* pad of wool and a bandage, before the remaining treatment is undertaken.

Mobilisation of all joints in the limb that have not sustained injury may be freely administered from the outset, and all relaxed and active movements that do not tend to lay any

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stress on the torn structures in the neighbourhood of the injured joint may be prescribed.

Dislocations of the *clavicle*, fortunately rare, are easy to reduce, but it is excessively difficult to maintain the reduction. Thus no movement must be administered or allowed to any part of the limb above the elbow until explicit instructions are given. Many surgeons elect to disregard the deformity. In this event mobilisation should proceed apace. Should it be decided to try to ensure the reduction of the acromio-clavicular joint, a very special technique is required. The treatment, though difficult to carry out and irksome to the patient, is one that is commonly crowned with success. If it fails the patient is little, if any, the worse, and he has been given a good chance of complete recovery. The essentials are as follows. Reduction, which is easy, is performed with the patient recumbent. A firm pad is placed just in front of, and a second just behind, the joint. A pressure ring is placed round the olecranon, and a loop of bandage is tied as firmly as possible over the two pads and round the olecranon. The knot rests between the pads. The hand rests so that the thumb and first finger embrace the front of the neck. A sling is then arranged as shown in Fig. 77, p. 151, but the elbow is brought further forward over the front of the chest. The difficulty is to ensure that the loop, on which the stability of the joint depends, remains in position. The free use of safety-pins, which fix accessory loops round the trunk and the arm to the primary loop, affords the only solution of the problem. The whole is then stabilised by the free use of flannel bandages to fix the sling to the trunk, the turns of which are fastened to the sling and to one another by safety-pins. This fixation must be continued for four weeks without relaxation other than for daily treatment. The use of a sling is required for six weeks. The position is one that is cramped and uncomfortable, and daily treatment is essential if undue stiffness throughout the limb is to be avoided. The surface bandages are removed, and then the patient is placed recumbent. Massage should include the whole of the neck, and the pectoral region in turn, and the whole of the upper limb. The area round the origin of the deltoid calls for special attention. Free movement may be given to the elbow and all joints distal

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to it, great care being taken to ensure that no portion of the weight of the upper extremity is allowed to exert a downward dropping influence on the point of the shoulder. Active movements should be prescribed for rotation of the forearm, for the wrist, and for all the joints of the hand. When movement of the injured joint is prescribed, treatment may proceed as if the injury had been only a sprain, but mobilisation must proceed rather more gradually. If the sterno-clavicular joint has been dislocated similar treatment should be devised, but the prospect of maintaining the reduction of the joint would be far more speculative, and it is usually best to ignore the displacement. Sprains of the clavicular joints are rare; if treatment is ordered it should proceed as for dislocations, but free movement may be administered to the shoulder. This must be limited in the earlier stages to elevating the arm through a range of movement that is just less than a right angle. Shrugging of the shoulders may be commenced in about three days, and then the elevation of the arm may proceed by slow stages. Ordinary underhand use of the arm may be allowed from the outset, but the elbow should be supported on a sling for the greater part of the day, and the lifting of weights is prohibited. The pectoralis major and the deltoid call for special care in devising exercises.

If the patient is seen within a few hours after *dislocation of the shoulder*, to attempt to secure reduction under the influence of massage is the correct course to adopt. If it succeeds, there is less likelihood of further damage being done to the soft parts than if reduction is performed under an anæsthetic, particularly under gas. If it fails, reduction under an anæsthetic is rendered a no less, and probably a more, simple procedure. On one occasion I was able to reduce a sub-coracoid dislocation under the influence of massage when two attempts at reduction under gas had failed. The technique is simple. The patient is treated sitting in the position advocated for the treatment of a fracture through the shaft of the humerus (see Fig. 74, p. 147). The elbow is flexed to a right angle and the hand is supported on a sling across the chest, and not as shown in the illustration. Massage begins over the side of the neck, as shown in Figs. 132 and 133, on p. 298. The back of the neck is then dealt with in

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the same way, and finally the pectoral region. The position shown in Fig. 74 is next adopted, but the forearm still rests across the body, and the left hand secures a firm grip upon the forearm near the elbow and exerts a constant pressure downwards in the long axis of the humerus. Meanwhile massage is applied, according to the evidence of persisting muscular spasm, to the upper arm, or shoulder-girdle muscles, or chest and back. Slowly the spasm of the muscles that control the movements of the joint relaxes and, in fifteen to twenty minutes from the outset of treatment, reduction may be anticipated. If it becomes evident that the muscle spasm is not relaxing a few minutes after the tension begins, the patient should be placed in the recumbent position. When once reduction has been effected there could be no greater error than to enforce complete rest for the joint. This is probably the most fertile source of recurrence. The stability of the joint depends entirely on the muscles that control its movement, and, if these muscles are allowed to waste, instability of the joint is inevitable. Everything possible, therefore, must be done to maintain their strength and tone. Massage alone can help, it is true, but muscle activity and work can alone prevent loss in both respects. If reduction has been effected without delay the amount of wasting is negligible, and, as the stability of the joint depends on this factor, it follows that the chance of immediate recurrence is not great. If the patient's clothes are split up in front so that he can put on all his things as he puts on an ordinary jacket, he may dress immediately after his treatment, carry his hand in a sling, and begin ordinary light underhand use of his arm from the outset. He should be encouraged to move his shoulder freely, provided he does not abduct above the horizontal. As the result of this treatment many patients pronounce themselves cured in seven to ten days, but this is probably incorrect. They are probably not as safe after so short a time as they were before the accident, but the difference is not great, and, barring accidents, all should go well. It must be clearly understood that it is safer to administer movement freely during the first week after dislocation than during the third, if the joint has been immobilised meanwhile. Exercises should be administered to

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strengthen the pectoralis major, sub-scapularis, and the two spinati, but special attention should always be paid to maintaining the strength of the deltoid.

One form of "sprain" of the shoulder calls for special mention. It is the so-called "stubb'd shoulder." This is seen occasionally as a sequel to Colles' fracture, and also as the result of a fall on the point of the shoulder. The nature of the injury is that the head of the humerus is driven with violence against the glenoid. The articular cartilage lining the latter is injured, and, being avascular, it can be repaired only by vessels creeping in from the periphery. This corresponds to the phenomena witnessed after contusion of the cornea. It is a process that takes time, and it is only when the injured patch becomes vascularised that pain of any severity is noticed. This occurs usually about three weeks after accident. The temptation is to regard the shoulder injury as one of such long standing that movement should be forcibly restored. It may even be attempted under an anæsthetic. The result is invariably disappointing, as, instead of hastening recovery, it must inevitably bruise and injure the delicate vessels that nature has formed to hasten repair. The only treatment is absolute rest for about three weeks, though massage for the rest of the limb will maintain its nutrition and mobility. It may be asked, "How is a masseur to be expected to know this condition and to avoid doing injury?" The answer is simple. Here, as in all other cases of injury, no harm will arise if the golden laws of treatment are observed: first, that any relaxed movement may be administered only if it is painless; second, if range of movement one day is less than the previous day, too much movement has been given and the dose therefore must be reduced; third, any increase of pain on voluntary movement, or any increasing loss of mobility, are contra-indications to the continuation of mobilisation. Respect for these laws means that no injury will be done; neglect invites catastrophe. The answer to our question then is this: there is no need for a masseur to be a diagnostician; he should know and recognise danger-signals, and should not be afraid to admit having done too much one day and to reduce the dose accordingly. It is no part of his responsibility to decide *what* has happened, that

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is the surgeon's work : his duty is to report to him in the event of untoward symptoms being noticed.

One of the dangers encountered in treating *dislocation of the elbow* has already been dealt with when considering fractures round the elbow-joint (see p. 149). It was then told how, in the absence of all X-ray evidence of injury to bone, there is a tendency to the outpouring of a vast formation of new bone. Massage to restore vaso-motor balance and to assist the absorption of swelling should be given, but movement must be very guarded in the presence of local swelling which may indicate blood-clot. There is another danger. The injury is severe, all the structures in front of the joint are severely torn, and therefore have to be repaired. This is done by the formation of granulation tissue. If this is broken down again when once it is formed, not only does blood escape from the torn vessels of which it consists—thus producing the source of danger we have already seen must be avoided—but a stimulus is given to the formation of more granulation tissue. No matter how much is laid down it will in the end organise into fibrous tissue. If there is no excess, this will serve only to repair the damaged structures ; if it is excessive, adhesions will also form. Suppose, then, that treatment is conducted in the fully-flexed position, there would seem to be two alternatives : first, to perform no movement, in which case it is certain that the bands which effect the repair will be too short to allow movement in the future, or, second, to administer movement and chance doing so to excess. It is essential, therefore, to know what can be done with safety. Obedience to the laws just recapitulated will avert disaster, but here it is wise to state once more in addition, that relaxed movement must be performed to its full limit once and once only, no matter how small the range may be. Turning the patient's forearm into a sort of pump-handle is absolutely prohibited, and it is only when the range of movement to be performed has considerably increased that to and fro movement through the sub-maximal range is permissible. All sprains of the elbow should be treated cautiously and on lines similar to those advocated for fracture near the elbow, or for dislocation. As the gravity of the injury is obviously less severe, treatment may be advanced with corresponding rapidity,

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but the main laws of treatment must be regarded scrupulously. No injury to the elbow-joint should ever be treated light-heartedly. Care and caution never produce untoward results, their neglect may lead to disaster.

*Dislocation of the wrist* or of any individual bone of the carpus is always a severe injury. If the wrist has suffered, all that has been said on the subject of fracture through the lowest inch of the radius holds good as indicating the line of treatment to be followed. It is not a common injury, and, after reduction, the surgeon will probably have placed the wrist in a slightly dorsi-flexed position. If so, the formation of disabling adhesions is not likely to occur (Robert Jones) and restoration of function should be rapid.

If one or more *bones of the carpus* have been dislocated, open operation is almost essential to success. If a tentative trial is to be made to see whether massage and mobilisation can effect a cure, treatment should aim at restoring dorsi-flexion. This law should be respected in the massage-room as well as in the operating theatre during the treatment of all injuries of wrist and carpus below the level of the lower end of the radius. If this position is not secured, and if the dislocation is left unreduced, months of massage and manipulation will probably effect only a very partial restoration of function. Any attempt to hasten the process will render it more prolonged. Otherwise treatment may proceed on the general lines mapped out for Colles' fracture (see p. 157). If any offending fragment has been removed by operation, treatment is the same, but much more rapid progress can be made. Again dorsi-flexion must be maintained.

A detailed account has been given (p. 129) of treatment applicable to fracture without displacement through the lowest inch of the radius. This will furnish a full guide for treatment of a sprained wrist. Most severe "sprains" in this situation will be discovered to be fissure fractures on examination with the X-rays, the most common being a fissure fracture through the radial styloid process.

All injuries in the hand may be treated on general lines. Dislocations are very liable to recurrence, and so active movement must be prescribed cautiously. Massage to hasten repair

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must be applied to the whole limb, or at least to the level of the elbow. All movements of shoulder and elbow should be prescribed freely to encourage circulation and prevent stiffness.

*Dislocations of the hip* are not very liable to recur in the massage-room. The injury is most severe, and the surgeon invariably prescribes treatment. Recovery would be more rapid as well as more complete were mobilisation started at an early date. The chance of the dislocation recurring as the result of treatment can only be negligible, while delay inevitably entails the formation of adhesions. General massage for reflex effect and for circulation is called for ; the patient should be taught to exercise all muscles, and internal rotation is the last movement that should be administered or prescribed.

Sprains of the hip are very rare, as fracture or dislocation takes place instead. If met with they should be treated on general lines.

*Dislocations of the knee* never arrive in the massage department while the injury is still recent. Sprains, cases of "water on the knee" from various causes, and "slipped cartilage" cases that have been reduced, are frequently recommended for treatment by mobilisation and massage.

In the treatment of all cases of injury to the knee two points must be kept in mind—first, that the injured structure must be guarded from strain while repair takes place, and, second, that the quadriceps extensor will waste as a whole, but that the lower fibres of the vastus internus will do so more rapidly and more thoroughly than the rest of the group. The result of this is that, when the quadriceps contracts as a whole, the patella will be drawn up somewhat obliquely to the natural line of movement. Thus, in Fig. 91, if A is the line of pull of all the muscles except the vastus internus, B is that of the vastus internus, and C the resultant of these two forces, C will represent the normal line of movement of the patella. It is obvious that any diminution of the force B will tend to shift the resultant C nearer to A. In addition the lateral fixation of the knee is insecure, and a certain amount of preternatural mobility is possible. The clinical effect is recurrent effusion. Hence the importance that must always be attached to building up the strength of these fibres of the vastus internus. This

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may be effected in three ways. During normal extension of the leg the vastus internus contracts in proportion to the other muscles, but in forcible extension it seems to play a more prominent part. Hence the patient should be instructed to "try to bend the knee backwards" both lying and standing. The second exercise is merely a special application of this

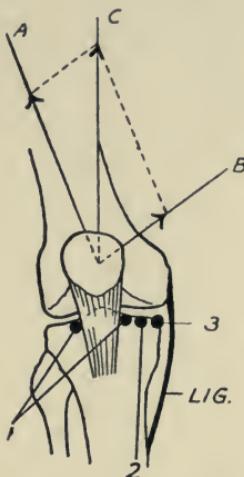


FIG. 91.—(After Robert Jones.) To show how wasting of the vastus internus alters the resultant of the direction of the pull of the whole quadriceps, thus causing the movement of the patella to deviate from its normal direction.

- A, line of pull of the quadriceps as a whole.
- B, line of pull of the lower fibres of the vastus internus.
- C, resultant line of movement of the patella.
- 1, Tenderness at these points on extension indicates a tender post-patellar pad.
- 2, Tenderness indicates injury to anterior portion of the internal semilunar cartilage.
- 3, Usual point of tenderness after strain of the internal lateral ligament.
- LIG. indicates the position of the longest fibres of the internal lateral ligament.

method, namely, tip-toe walking with knees stiff. The third is performed from the fundamental standing position, the knee is slightly slackened, and an attempt is made to rotate the joint inwards. This requires practice, but is effective. All three are rather monotonous and require persevering repetition. If this is not forthcoming, or if the wasting is marked, treatment by graduated faradic contraction should be given.

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If the internal lateral ligament has been torn, or if, in addition, the internal semilunar cartilage has slipped, treatment should follow on usual lines ; but it should be noted that the internal lateral ligament has broad attachment both above and below, the deep fibres being comparatively short and the superficial longer (see Fig. 91, Lig.). Local treatment should therefore be directed to a wide area, extending from a considerable distance above the lower end of the condyle of the femur to the shaft of the tibia. The third exercise mentioned above must be omitted.

After massage for reflex effect, to remove spasm, to assist the circulation, and for hastening the absorption of local effusion, relaxed movement should be administered with the usual precautions ; but particular care should be taken not to allow any tendency of the tibia to separate from the inner condyle of the femur. In other words, no "gaping" must be allowed on the inner side. The safest position to conduct treatment is to rest the limb on the masseur's lap (see Figs. 32 and 33). The one test of successful treatment is the progressive absorption of fluid. If it is noticed to have increased one day, or even if it is found not to have decreased, then treatment has been excessive. As soon as relaxed movement to a right angle has been reached, exercises without weight may be prescribed (see Chapter XX.). Whether the sole and heel of the boot are built up on the inner side or not, the patient must be instructed to walk correctly, fair heel and toe, to keep the toes straight, and to throw all weight on the outer side of the foot.

In all recent knee injuries special care must be taken that relaxed movements are absolutely painless, are very minute in amplitude at the outset, and that the leg is never treated as a pump-handle. From the outset the patient should be taught to exercise the quadriceps, even though the limb is fixed on a back-splint and no movement is allowed.

A common cause of "water on the knee" is the nipping of the retro-patellar pad of fat. In this case *only* complete extension must be avoided, as pain over the position shown in Fig. 91 (1), on extension, is the sign by which we recognise the condition. It is due to the "nipping," and every care must be taken to avoid repetition of the accident. This injunction

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should be unnecessary if the laws for administering relaxed mobilisation are adhered to, as any movement administered must be painless. Some, however, seem to think that because extension is painful it is therefore their duty to work away at it. It is in reality the ideal way to prolong and augment the evil they are trying to cure.

When treating any case of synovitis of the knee we have, perhaps, one of the best examples in the whole body of the difference between prescribing movement and function. There is all the difference in the world between allowing a patient to swing his leg and to use it for walking. It is the weight-bearing function of the lower limb that is the last thing we can restore after injury. Everything else may be perfect long before use is possible ; but the day when use can be permitted will arrive far more quickly, if the other functions and activities are maintained intact than if they are neglected.

*Dislocations of the ankle* are almost always fracture-dislocations. As regards their treatment, nothing further need be added to what has been said on the subject of fractures near the ankle-joint (see p. 170). The great dread that should always be present in the mind of anyone treating these injuries is the subsequent development of flat-foot. Exercises for the muscles that help support the arch should therefore be given and prescribed from the outset, and particularly the short muscles of the foot. Re-education in walking should always occupy a prominent position in the treatment of these cases.

The same applies when treating all *sprains of the foot*, and treatment should follow exactly the course mapped out for a sprained ankle. Massage should include at least the whole of the leg, and also of the thigh if the injury is severe. The subsequent re-education in walking is, of course, all-important.

## CHAPTER XV.

### THE TREATMENT OF RECENT INJURY (*continued*).

#### TORN MUSCLES; BRUISES; POST-OPERATION TREATMENT.

THE *treatment of torn muscles* by mobilisation and massage resembles very largely that applicable to torn ligaments. The position of these accidents is usually at or near the bony origin or attachment of the muscle. The muscle or its tendon may not be actually torn ; the injury may be to the periosteal insertion. Muscle fibres may, of course, be torn anywhere. Examples of injury to the periosteum, or to the muscle near its insertion to the bone, are found in the so-called "tennis" and "golf elbows." One form of "golf shoulder" is due to rupture of some fibres in the deltoid. If suitable and early treatment is not forthcoming, granulation tissue for repair is formed and is broken down the next time the muscle contracts violently. More granulation tissue forms and again is broken down. Soon nerve fibres become involved, the pain gets worse, and use is restricted. The granulation tissue then becomes organised and an adhesion is formed, perhaps with the involvement of the nerve fibres. Wasting soon follows, and the patient is left with a chronic incapacity for his favourite game. His general health suffers, and a serious cycle of events is started. The "tennis-leg" is said to be caused by tearing of the plantaris tendon. Probably this is a rare accident. Rupture of any fibres in the calf muscles may be the cause of the pain. The patient usually imagines that he has been hit on the back of the leg by his partner.

The immediate treatment is to check effusion, or, if effusion has taken place, to disperse it before it has had time to organise. The importance of this procedure is seen after subcutaneous section of the plantar fascia in the treatment of a pes cavus. If haemorrhage is arrested by pressure, the patient is rarely if ever conscious of any discomfort in the sole ; if pressure has been

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inefficiently applied, there may be a tender lump in the sole that will cripple the patient for weeks, or it may be even for months.

Having checked effusion locally, it is necessary to counter any vaso-motor reflex disturbance, and treatment for the first day ceases.

Next day there is little fear of recurrence of haemorrhage provided the muscle is not allowed to contract. All the other muscles in the limb may be exercised, and relaxed movement through minute amplitude may be given, in the direction which is normally controlled by the injured muscle. Local treatment should be given to any area where there is local swelling or oedema, but it must be so administered that there is no danger of loosening any clot that seals the mouth of a torn vessel. This entails pressure of an even character, slowly and gently applied, and the most suitable treatment is gentle kneading with the ball of the thumb or palm of the hand. This should follow the administration of general massage to produce reflex effect and to promote circulation throughout the limb. It is wise to maintain pressure with wool and a bandage to ensure that there is no increase in local effusion. Nothing will hasten the wasting of a muscle more effectively than separating it from its attachment. Hence the desirability of renewing its function of contraction with as little delay as possible after any portion has been torn. Herein lies a difficulty: contraction is essential; strain is most detrimental. By performing relaxed movements a muscle can be made to shorten and elongate to a certain extent, but this is not enough entirely to prevent wasting. A patient can usually be taught to contract and relax a muscle without placing any strain upon it, and if he will perform this "exercise" faithfully much may be achieved. Before active contraction is prescribed the limb should be placed in such a position that the origin and insertion of the muscle are as close together as possible. Mr. W. R. Bristow uses, with admirable success, a means whereby this end can be attained without the co-operation of the patient. He uses a faradic current of low voltage, the strength being regulated by manipulation of a metal core, which is alternately pushed into and withdrawn from the hollow in the secondary coil. In this way a graduated contraction is produced which, to quote one instance only amongst many,

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aids in the restoration of a victim of a rider's strain more rapidly and completely than can any amount of perseverance on the part of the patient or his masseur.

Not only is contraction essential to the maintenance of muscular strength, but, after rupture of muscular fibres, it is essential to prevent the formation of adhesions. Once any muscle, or even any group of fibres within a muscle, becomes adherent to an adjacent group, trouble is sure to follow ; and the stretching of the adhesions may be a prolonged and tedious process. It can be effected by the prescription of suitable exercises, but here again contraction in response to electrical stimulation will succeed far more rapidly, in most cases, than if voluntary contraction is relied upon alone. A combination of both is, of course, the ideal.

The amount of strain that can be placed with safety on a muscle that has suffered injury must depend upon the extent of the injury. The labourer who " strains " the muscles of his forearm slightly puts on a leather wristlet, which acts as a sort of block to his movement. He then goes on with his work. Often this suffices, and Sir Robert Jones has applied the principle further, and " straps " the deltoid near its insertion, the quadriceps above the patella and the leg muscles above the ankle, when these muscles have sustained injury. Some use of the injured muscle is therefore not only to be allowed but is actually beneficial, and the masseur can often render great assistance by using one hand to replace the " wristlet " of the labourer. To decide how much movement to give or how much use to prescribe we are driven back to the golden rule of all treatment of recent injury, that movement, active or passive, must be painless. To ensure this the movements must be slow and the contraction must be performed rhythmically, not only as regards the sequence of movements, but also as regards the actual contraction during each several movement. In other words, there must be no spasmotic or irregular twitching.

Perhaps the most troublesome form of muscle injury is that which befalls the erector spinæ or one of the small muscles in the back. The trouble is not that the injury is necessarily severe ; but because, if treatment is not immediate and efficient, pain may prove most intractable and crippling. There seems to

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be a strong tendency for a neurotic element to creep in, and then the patient's condition is truly lamentable. Firm kneading to prevent effusion, or to disperse it if formed, should constitute immediate treatment ; and mobilisation, which of necessity must be chiefly active, should be prescribed with as little delay as possible.

If a tendon is severely torn so that few fibres only remain intact, the surgeon will be wise if he fixes the joints concerned during the period of repair. If massage is ordered, no movement of any joint should be allowed which cannot be controlled by the patient to the extent of fully restoring the position from which the movement started. Otherwise repair may be impeded. Rupture of the extensor tendons of the interphalangeal joints is by no means uncommon. Even when rupture is apparently complete it is often surprising how perfect recovery may follow the use of splintage applied to the posterior aspect of the joint. This may be applied only to the joint concerned and allows of a very considerable freedom in use.

Sometimes the *deep fascia* over a muscle is torn and the muscle fibres tend to protrude through the rent during contraction—a hernia of muscle. This is a trivial accident, but may cause much discomfort, and the "lump" may produce a marked psychical effect. Recovery depends on the repair of the sheath, and, if repair has commenced, it may be completely undone by a single contraction while the orifice is not guarded. Thus no contraction of the muscle must be allowed unless a hand or bandage is placed over the whole area of injury. This precaution taken, mobilisation may be administered and prescribed freely.

It is not very often that the masseur is asked to deal with a *simple bruise*, yet the relief that can be given by skilled massage is immense and the period of discomfort can be greatly shortened. Treatment should be given as for a severe sprain : surface stroking (avoiding the injured area at first and gradually encroaching on it later) is succeeded by deep stroking, and this in turn by local kneading. The kneading is best performed by placing the whole palm of the hand firmly over the site of injury, and then by imparting a circular movement to the hand. Surface stroking terminates the *séance*.

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If a *nerve* is injured (the ulnar nerve frequently suffers from bruises), treatment follows on similar lines ; but care must be taken to avoid any movement or pressure that causes pain. One of the dangers of treatment is that pain can be greatly relieved, and the temptation to do more and give prolonged local treatment may be great. This is a mistake ; and a frequent result is that some two or three hours later the patient is worse off than if he had never been treated. Other nerve injuries will be dealt with in subsequent chapters (see Chapters XXIII. to XXV.).

*Post-operative* treatment must be considered, from the massage point of view, as entirely different to the treatment of other recent injuries. The difference is this : the surgeon is almost certain to issue definite instructions as to what he wishes to be done. Hence little need be said here, save to insist once more that all massage movements must be slow, gentle, rhythmical, and devoid of pain, while any form of mobilisation must equally be painless.

Operation scars of recent date must always be treated with respect ; and care must be taken not to tear the granulation tissue which holds the edges of the wound together. Hence all movements of massage should tend to press the edges towards each other ; and, if any movement performed during the mobilisation tends to drag them apart, the granulation tissue must be adequately supported and juxtaposition of the edges must be maintained. A scar is not organised firmly for about three weeks.

It not infrequently happens that a surgeon breaks down adhesions in a joint and then orders massage and mobilisation to commence forthwith. It is preposterous that such orders should be given without informing the masseur as to the amount of movement that was secured under the anæsthetic, and as to the amount of difficulty experienced. Yet this often happens, and the masseur is left to judge as best he may as to the extent of "injury" inflicted by the operation. The amount of pain and the difficulty in relieving it are fair guides. Surgeons usually expect any movement which has been performed under the anæsthetic to be performed at the first massage *séance* after operation. This is doubtless ideal but is not often easy, par-

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ticularly if the surgeon has made a mistake and done more than was desirable. Also it is most difficult to know exactly when to "break down a joint," or even to judge what joints should or should not be treated in this manner. The ideal method of ensuring satisfactory after-treatment would be for the masseur to be present at the operation, and it should always be arranged if possible. If this prove to be impracticable, then undoubtedly explicit instructions should be given, and if "full movement" is ordered it must be given. Should it cause great pain, the fact must be reported before the movement is repeated. The best plan for all concerned is to aim at securing on the third day the full range of movement that the manipulation has rendered possible. If, after prolonged massage and patient attempts to secure this result, it becomes obvious that movement is more limited than before the operation, we may be sure that something is wrong—either that the operation should not have been performed or that too much has been attempted.

After any such operation it is almost impossible to adhere too strictly to the rule of painless movement, and therefore some guide is necessary as to the amount of pain that it is permissible to inflict. A good working law is that if pain can be relieved by massage all is well; if pain ceases within half an hour of the limb being placed at rest no deleterious result need be feared. If, on the other hand, pain is persistent, if swelling or synovitis do not rapidly subside, or if there is any increase in the difficulty of securing movement, or of pain during movement, then too much is being attempted. The principles underlying the administration of forced movement under an anæsthetic are dealt with in a subsequent chapter (see Chapter XVII.).

One word of warning is needed about the treatment of limbs after a bone has been plated. There is a tendency to believe that the plate will act so efficiently as an internal splint that no disturbance of the fragments need be feared. This is a most dangerous delusion. After all plating operations no less care should be exerted to avoid placing any lateral strain on the site of fracture than if the plate were not present. At operation the screws doubtless "bite" firmly; but this entails pressure on the bone, and in a few days the "bite" is far less firm than at first. Strain at the site of fracture may then

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serve to loosen the screws and prejudice the whole success of the operation.

In all post-operative treatment, massage should aim at relieving pain and restoring circulation. Mobilisation should aim at teaching the muscles to contract, whether movement is possible or not. It is usual to wait for three or four days to elapse before beginning post-operative treatment. This suffices as a rule to show whether suppuration is calculated to supervene or not. Should it occur before the masseur sees the case he cannot be blamed for it. But there is really no reason why treatment should not begin after, say, twenty-four hours. When all is said and done, operation is only one form of recent injury.

If massage is ordered while a wound is still septic, special precautions are necessary. The author recalls the case of a nurse who developed blood-poisoning as the result of a prick on her thumb while doing district maternity work. Massage was commenced while there were still six drainage tubes in the limb, the top one being in the axilla. Not only did the application of massage save many doses of morphia, but complete use was restored to hand and arm except for the interphalangeal joint of the thumb, where the tendon had actually sloughed away. In so severe a case nothing but surface stroking is permissible, and mobilisation must be painless. The presence of sepsis is no contra-indication, if this law is respected. As Lucas-Championnière pointed out, many years ago, the presence of an open wound or even of sepsis is no contra-indication to skilled massage and mobilisation. Far otherwise indeed: the treatment is essential if subsequent disability from scarring and adhesions is to be reduced as far as possible.

When the sepsis is localised the case is simplified, but this very fact enhances the danger in one direction. If a knee-joint, for example, is septic and massage is ordered, it is right and proper that surface stroking should be succeeded by massage to aid the circulation. A wide berth must, however, be given to the area of sepsis, otherwise there will be great danger of breaking off an embolus in one of the veins. It is true that any area where thrombosis is present is tender to the touch, and so, if the massage is painless, there is really little risk. But the patient is sure to be in discomfort and probably in pain, and the

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slight additional pain due to gentle massage may be accepted without complaint or even with actual relief. "It is a pleasant sort of ache," the patient may say. If no sepsis is present, this "pleasant pain" may be disregarded; but in the presence of sepsis it must be regarded as a serious danger-signal.

Throughout this book treatment by exercises receives for the most part but scant notice—so, too, must treatment by electrical methods. It is not intended to belittle the value of either, but each requires such special consideration that a book on massage cannot be made to cover the ground.

Short reference must, however, be made to the use of electricity in the treatment of injury, and particularly to the treatment known as "Graduated Contraction."<sup>1</sup> Its value is seen in four directions. First, it provides a means of preventing muscular wasting after injury, and, second, of exercising a muscle without moving the joints upon which it acts. Third, it enables us to exercise any individual muscle which happens to have suffered injury out of proportion to that sustained by its synergists, and an example has been given when referring to rider's strain. Fourth, it affords a means of exercising any muscle, which may have wasted to such an extent that the power of voluntary contraction is too poor to allow the patient to re-develop it by exercise with reasonable rapidity. The wasting of the quadriceps after injury provides a dual example. Not infrequently the muscle is so wasted that, if its re-development is left to the patient's own efforts, recovery is likely to be tedious and prolonged. Also, unless the power of voluntary contraction is well maintained, it is a most difficult task to exercise the lower fibres of the vastus internus as suggested on p. 183. It is in cases of this type that treatment by graduated contraction finds its *métier*.

<sup>1</sup> For a full account of this method of treatment see "Treatment of Joint and Muscle Injuries," by W. Rowley Bristow, Oxford Medical Publications.

## CHAPTER XVI.

### THE TREATMENT OF THE AFTER-EFFECTS OF INJURY.

WHEN some little time has passed since the receipt of injury the condition depends entirely on the previous treatment. The points that will now require attention are circulatory troubles, scars, stiffness of joints, adhesions, and the loss of muscular power.

It will save repetition if it is stated at once that the presence or absence of sepsis is all-important as regards prognosis. If sepsis has been present there *should* be always before us the danger of lighting up a process that has become quiescent. The result of our recent experiences in military surgery has emphasised the fact that no operation of an orthopædic character should be undertaken for at least six months after the final closing of a septic wound. The masseur should keep this in mind. Many of the limbs we are now called upon to treat, in order better to fit the discharged soldier for civilian employment, are in a parlous state. Months of perseverance can only improve them, and nothing can really cure. But patience can work wonders, while haste will often give rise to the most unpleasant of surprises by causing infection in a limb to flare up in a most disconcerting manner. Apart from the consequences to the patient, it is heart-breaking to see the labour of months thrown away as the result of a fit of impatience on the part of the masseur. But, putting impatience and excess of zeal aside, recovery from the effects of injury that has been complicated by sepsis must be slow and tedious, and the slowness of recovery varies directly with the extent of the sepsis. All attempts injudiciously to expedite recovery are doomed to have the diametrically opposed result.

In the absence of sepsis an excess of zeal will not only cause pain, it may cause synovitis, and will assuredly delay recovery. If long continued, irremediable harm may be inflicted ; but

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this should be confined to those cases where lack of clinical experience and insufficiency of training are the root of the evil. Many reports of various catastrophes have reached the author since the outbreak of war, and it is for this reason that he has made the present attempt to try to supply a substitute, inadequate though it must be, for clinical experience where this is lacking. One thing in particular has tended to militate against the success of the massage treatment of the wounded, namely, the attempt to treat more cases in a limited time than can be accomplished with efficiency. Reduction of the time devoted to treatment tends to increase its severity, and herein lie potentialities for much evil. If overworked, the law for the masseur should be—give inadequate treatment and trust to the patient's own efforts more than would usually be deemed desirable, but do not attempt to compress half an hour's treatment into fifteen minutes.

In order to aid the circulation every agent at our disposal must be invoked ; but now, as in more recent stages, surface stroking should begin and end the *séance*. The stroking becomes more and more firm by very slow and gradual stages. The rhythm is maintained throughout. Some form of compression massage follows, commencing if possible above the level of oedema (if present) and gradually working downwards. A constant return to the parts already treated must be made as each new segment of the limb is reached. The use of a mechanical vibrator is often helpful, but should not be continued for more than two or three minutes at a time over one spot. If continued too long it is apt to paralyse the unstripped muscle fibres of the arterioles. It is useless to devote less than twenty minutes to an attempt to render efficient assistance to the circulation of a limb when oedema is present. Half an hour is none too long. The massage need not, however, be consecutive, as it may, with advantage, be interrupted for short spells of active mobilisation. The passive part of the treatment should, of course, be undertaken during the continuance of the massage. (See also Chapter XXXII.)

The treatment of scars is a special art in itself, and some masseurs seem to be endowed by nature with special adaptability for this branch of work.

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It is a great misfortune that the beneficent effect of massage in promoting the healing of open wounds has not received a more general recognition. Months of tedious waiting for a wound to heal might often have been reduced by half or one-third, and many an operation for grafting would have been obviated altogether. The reason is not far to seek. One of the most generally recognised features of scar tissue during its organisation is that of contraction. As contraction proceeds the scar becomes avascular. Hence it comes about that, if a wound takes any considerable time to heal (probably anything over six weeks), the resulting scar formed round the periphery tends to contract. This must shut off from the remaining central surface the vascular supply which is required from the periphery in order that healing should proceed rapidly. The tendency can be entirely overcome by massage. The technique is simple, but strict asepsis is essential. In the first place everything we can do should be done to secure the maintenance of the fullest possible blood-supply to the whole part—either by muscular activity, whenever possible, or by massage when this is impossible. Thus, if it is desired to heal a pressure sore over the heel, as full activity as possible of all the thigh and leg muscles should be encouraged. The whole of the skin around the wound or in its vicinity should then be subjected to a thorough dose of dry cupping, following the technique described on p. 370. A very wide area should be treated. In the instance quoted above the whole of the calf and the sole of the foot should receive attention. Frictions with the tips of the fingers follow all round the edges of the wound, the pressure exerted being sufficient slightly to push the edges of the wound towards the centre of the hitherto unhealed area. The frictions should be quite firm and deep. When dealing with old chronic ulcers the tips of a pair of dissecting forceps are wrapped firmly in cotton-wool and the whole of the raw surface is firmly rubbed—it may be even scrubbed—with full strength peroxide of hydrogen. The process is continued until the froth from the peroxide is coloured a pale pink, which, however, soon turns to a dirty brown. The froth is then washed off with normal saline and a moist dressing is applied. It is often useful, while applying the cupping, to keep the cup stationary close to the wound, while the patient is

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encouraged to move the underlying muscles as freely as possible. If sepsis is still marked the cup may produce a slight pustular acne, and its use must then be discontinued. Occasionally, in the presence of sepsis, the rate of progress is found to be disappointing. In these cases it appears probable that the sepsis is as inimical to healing as the cicatricial contraction in the outlying parts of the scar. Treatment by the ultra-violet rays will then succeed where massage fails; but, if the contraction is the main cause of the delay, the light will have little beneficial effect. The application of radium probably has an effect similar to that of the ultra-violet rays.

A recently healed scar must, as was stated in the previous chapter, be treated with respect. For three weeks no movement may be performed which tends to separate the healing surfaces, and then only if repair has been carried out in the presence of asepsis.

There are two methods of dealing with scars that I have found of great service. One is the free application of "cupping" (see p. 370) to all the surrounding tissues, starting over healthy tissue and gradually approaching the damaged area. The other is to immobilise the scar by pressure, laterally or vertically, as far as possible, and then to call upon the patient to contract and relax the muscles underneath the scar. In other words, the patient is taught to loosen his scar by voluntary effort. He may also be taught to do this while the cupping is actually in progress, or the cup may be used to steady the superficial structures during the activity of the muscles. In all cases the cup must be drawn away firmly from the surface so as to exert the maximum tension; it must not be pushed on to the surface of the part. . Finally, although these aids to loosening are of real and even great service, we are not doing the best for our patients unless we encourage to the uttermost the voluntary use of the muscles underlying a scar. Ordinary muscular activity will help to loosen a muscle involved in a scar quite as much as, if not more than, we can hope to do by other means.

However superficial it may appear to be, it is surprising how deeply the ramifications of an extensive scar may penetrate. Thus it never suffices to deal superficially with any obvious surface injury; it must always be considered as involving deeper

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structures until the contrary is proved. The question can be solved by rendering the skin and underlying structures as lax as possible and then by lateralising the whole area involved. Not infrequently a scar, which has no appearance of being adherent, will be found to dimple at one or more points, indicating the presence of some deep adhesion. Unless this is loosened first, any attempt to benefit the patient will be wasted. The first law in treatment should therefore be to relax the part to the uttermost, and then to lateralise all structures under the scar as freely as possible. This may be done by gripping the tissues on either side of the scar between fingers and thumb, or between the two thumbs or other parts of the hands. It is best to deal with these troublesome injuries by a process of slow and gradual stretching, and this can be effected by deep-stroking massage (usually employing the two thumbs), the pressure being exerted laterally. The stroke need not be a long one, and it should be performed so that the second thumb is exerting tension on the tissues before that exerted by the leading thumb has relaxed appreciably. If the pads of the thumbs do not afford a sufficient surface, the balls of the thumbs, or even the whole surface of the palms of the hands, may be used instead. When the process has continued for two or three minutes it may be reversed, and the pressure should then be exerted from the opposite side of the scar.

In this way the deepest ramifications are dealt with. The part is then placed in a position in which the underlying tissues are not quite so relaxed, and the process is repeated. This helps to loosen the less deep strands; while, when the structures are put in full tension, only the most superficial part of the scar is being dealt with.

A vibrator can often be used with good effect in loosening superficial scars, but only in rare cases should it be applied to the scar itself. It should be applied round the periphery, and should always be used so as to exert a lateralising effect on the scar.

Some masseurs prefer to use oil when dealing with scars. In massage for other conditions this is a question of personal habitude, but in the treatment of scars it is often to the patient's advantage that it should be used. The scaly appearance of some

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scars can be greatly improved by using oil, but this is only a superficial effect. How the use of oil can benefit scar tissue is a matter for pathological speculation. If the use of oil has any inherent power for good at all, the explanation thereof must be somewhat as follows :—Scar tissue is avascular and consists of fibrous tissue. The oil penetrates the superficial parts and insinuates itself between the fibres, which then form a kind of sheath around the oily globules. Thus the fibres are converted into the cell-wall of an oil-cell, which becomes transformed into a fat-cell, and so the fibrous tissue, in turn, becomes transformed from a pathological formation into a normal tissue. We know that a weakling baby can absorb oil through the skin and derive nourishment therefrom. Hence we are justified in assuming that the oil can be conveyed from the surface through these artificially made "fat-cells" to the deeper parts of the scar. Suppleness is thus restored, and the substitution of normal tissue for pathological fibrous bands takes place. There seems to be no other explanation possible to account for the claim so often made that massage, using oil as a lubricant, benefits scars so much more readily than if powder is used. At the same time the explanation is wildly speculative ; and, until definite histological investigation has established it as a fact, I prefer to believe that it is the rubbing (and this alone) that does the good, and that any improvement noted in the deeper parts of the scar as the result of substituting oil for powder is due to improvement of technique thereby. A distinction must clearly be drawn between apparent surface change for the better and actual deep change. As already stated, the former is frequently noticeable.

Great skill is required in dealing with even the most insensitive of scars, and a patient will often do better if the whole treatment is performed in hot water. The *eau courante*, or whirlpool, bath has been greatly extolled in this connection since it was installed at the Grand Palais in Paris, and has become very fashionable in this country. The hot-air bath has a great reputation in the treatment of scars, and is often of service as a preliminary to treatment. Even better is massage under a radiant heat lamp. Massage in a bath of hot water or under the hot tap renders manipulation of a painful scar less difficult, and the *eau courante* bath tends still further to minimise

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the difficulty of dealing with a sensitive scar. The only possible explanation of the benefit to be derived from the swirl of water is that some beneficial reflex is set up. Experience has yet to prove that this can be excited more efficiently by movement of the water than by massage. Its advocates do not wish to supplant massage by its use, but only to use it as an adjunct. If massage treatment is crude, or if the main laws of massage treatment are disregarded, this bath will be found of inestimable service ; if massage treatment is efficient, its use will prove a valuable accessory.

Sir Robert Jones has devised a scheme for encouraging what he calls "gymnastics of the arterioles," which consists of contrast bathing, the limb being plunged alternately into hot and cold baths. It is not a pleasant treatment, but the patient soon accustoms himself to it, and there are cases where it has seemed greatly to assist progress. The use of the paraffin bath as a preliminary to massage for these conditions is now well established and its value proven beyond all question. It should be free from danger, if care is taken to ensure that there is no sensory disturbance in the part. Otherwise serious blistering may be encountered.

The whole idea of all these treatments is to secure beneficial effect through the vascular supply of the limb, and the repair of scar tissue requires an efficient supply of blood no less than do other reparative processes. General vaso-dilatation due to heat alone does not seem to meet the requirements, although as a preliminary to exercise of a stiff limb it may help considerably. Anyone, who is stiff after a long day "cross-country" and takes a hot bath, will bear testimony to this fact. The danger of the use of heat and other baths is that it may serve to cloak inefficiency in massage. But for the end in view, the vascularisation of a local area, no forms of heat treatment can hope to compete with ionisation. Here it is probable that the benefit is derived from the hyperæmia produced and not from the action of any particular ion, and valuable assistance might be anticipated from it. In this I have been disappointed ; and, though my conclusions will not be universally accepted, I can only say that, in my own experience, I have yet to see any definite evidence that a scar which fails to loosen as the result of massage treatment

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will do so when ionisation is added ; or, conversely, that one which is loosening satisfactorily will do so more rapidly when ionisation is given as well. Of the loosening effect of X-rays on scar tissue I have no experience, but I can bear limited testimony to the efficacy of radium. My attention was first called to its use by Capt. Stevenson, and since then I have watched the progress of several cases treated for me by Dr. Lynham at the Radium Institute. Capt. Stevenson summarises its action as follows :—

“ 1. Radium has a distinct sphere of usefulness in the treatment of scar tissue and fibrous adhesions.

“ 2. It is a valuable adjunct to other methods of orthopædic treatment, especially by shortening their duration.

“ 3. Its effect is rapid, sometimes immediate.

“ 4. It softens and mobilises scar tissue.

“ 5. It appears to facilitate subsequent removal of the scar by the knife.

“ 6. It enables structures, like tendons adherent to the scar, to free themselves.

“ 7. By loosening tendons and stiff joints it improves the functional power of the part.

“ 8. It possesses the advantage of acting, to some extent, as an innocuous local anæsthetic for about a week.

“ 9. It is particularly useful in treating scars and adhesions in the hands and fingers.

“ 10. It is easily applied to the surface of the skin, and by this method causes no inconvenience to the patient.

“ 11. To obtain the best results a single large dose is necessary.

“ 12. The dose should not be so great as to produce inflammation of the skin.

“ 13. With suitable dosage it appears to produce no ill effects.

“ 14. In small doses it appears to hasten the healing of wounds and to allay the painful inhibitory effects of the products of inflammation.”

From my own limited experience I would add that the greatest caution must be used in prescribing dosage, as radium burns are disastrous. They are always indolent and often

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painful. Radium should never be applied if metal is still present in the depths of the wound, even though this is healed. Also undue expectations will lead to disappointment. For instance, the increased range in movement noticeable after the application of radium for a stiff finger may not be more than 5°, and the improvement, though present and therefore valuable, may well be overlooked on superficial observation. Many applications may be necessary, extending over many months, before any very marked change is noted. In some cases the action seems to be purely negative. But, taken as a whole, I think it safe to say that the general condition of the part treated is often considerably improved ; mobility (e.g., of a stiff finger) is sometimes very slightly improved ; the part often "feels more natural" to the patient, and is therefore used more freely ; sometimes manipulation is rendered easier ; and scars, beyond all question, do tend to loosen in a manner that surpasses that due to any other method of treatment with which I am acquainted. Progress, however, is often lamentably slow. But the dosage must be carefully guarded.

One lesson at least may be learnt from the advocacy of hot air, hot water, the *eau courante* bath or the paraffin bath as a preliminary to massage treatment, namely, that to mete out to a scar treatment that is purely local is inefficient. The whole of a limb, or at the very least the whole of a segment of a limb, should receive attention before any attempt is made at purely local treatment. Moreover, the massage used should consist of the stroking for surface reflex first, then general treatment to aid circulation, and finally local treatment.

If a nerve is caught in a scar, the benefit to be derived from massage is always problematical. Three methods of attack seem to be of service. The first should always be used, namely, surface stroking, followed by deep stroking. Gentle kneading of the area around the scar should follow, provided no pain is felt during the manipulations. As sensitiveness decreases the painful area is gradually approached. The second device is to place the palm of the hand firmly over the sensitive area and impart to it a circular movement, using the hand as a sort of millstone—the *mouvement en meule* of Lucas-Championnière. It often happens that a surface, which the patient cannot bear

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to be touched in any other way, can be freely manipulated thus. The third method is the use of a mechanical vibrator—a small hand machine run by electricity being almost essential. A "brush-pad" should be used, and it should be applied freely to those areas round the scar in which sensation is normal. The painful area is then gradually approached, and the actual surface itself can often be treated directly by transmitting the vibrations through the hand of the operator. How the vibration acts is not very clear, but remarkable results may sometimes be noted. The most probable explanation is that the shaking is sufficiently severe to loosen all small peri-neuritic adhesions, but of insufficient amplitude to cause pain. Moreover, as the vibrations are transmitted from a distance during the early stages, any stretching that takes place must be performed by very gradual stages. If there are three ways in which a painful scar may be treated, there is one in which it should not, namely, by any process of pulling or pushing directly applied to it, or of pressure over any selected portion.

If a joint is stiff, massage may be used as an agent in restoring mobility. The limb is supported in a position which corresponds to that adopted during the administration of relaxed movement, but with the difference that the support is withdrawn from the stiff joint so as to allow a certain amount of strain to fall upon it. Massage is then continued in such a manner as to add slightly to this strain, and each addition of movement is controlled by the other hand. The hand that performs the massage can detect any tendency to spasm on the part of the muscles controlling the movement, and can then deal with it by firm stroking, kneading, or shaking,<sup>1</sup> as may seem most desirable. If this does not suffice to secure relaxation, the other hand can release some of the tension. Relaxation can often be secured by calling upon the antagonists actively to contract.

The first step in the movement of a joint, which is not perfectly supple, is to discover, if this is not already known, how much free movement is possible, and how far, owing to anatomical alterations in the part, it may or may not be practicable to restore full movement. The latter information can be gained

<sup>1</sup> For the description of "shaking" see p. 47. It differs somewhat from the Swedish movement described by the same name.

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only from the medical man, as the prognosis depends almost entirely on the knowledge of what has already happened. The administration of a dose of relaxed movement should always

precede any attempt forcibly to move a joint, and sub-maximal movement may be repeated with ever-growing amplitude till the limit of free movement is reached. Then should begin slow, steady pressure aided by massage, every bit of "slack," as it is secured by the hand which is performing the massage, being as it were, "taken up" by the hand which is controlling the support. Voluntary effort, however, should always be encouraged. Try as we may, no stiff joint will ever recover unless the patient does his share of the work.

The use of mechanical agencies may also be invoked, as for instance the sliding seat when attempting to add flexion to the knee (see Fig. 50, p. 104). In the same way the weight and pulley apparatus, or the ladder, can be utilised to assist the restoration of almost any movement, both hands of the masseur being then at liberty for massage, or to assist in the movement, as may be most desirable (see Fig. 92).



FIG. 92.—To show one method of assisting movement while the patient is exercising on the ladder. The masseur is assisting extension of the elbow.

traction or pressure will do far more to restore a few extra degrees of flexion than any number of sudden jabs, unless freedom of movement is almost perfect. In this case, namely, when the patient has practically recovered from the point of view of mobility, intermittent pressure may often replace



FIG. 93.—To show first position when trying to secure the last few degrees of supination.



FIG. 94.—To show the second position when trying to secure the last few degrees of supination.

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the constant pressure here advocated, but it is a great mistake to allow it to do so in the earlier stages. Almost up to the end of treatment sub-maximal relaxed movements may be repeated, but not the forced movements.

As examples of the beneficial effect of the repetition of forced movement may be cited the restoration of the last few degrees of supination of the forearm or extension of the knee. It is not uncommon to find that supination is complete when the elbow is fully flexed and somewhat deficient when it is extended. Supination is started with the forearm lying across the chest as if



FIG. 95.—To show the final position when trying to secure the last few degrees of supination. The passage from the position shown in Fig. 94 to that here depicted should be rapid.

in a sling, it is increased as the elbow is flexed, and then it is maintained in this position while the elbow is rapidly extended (see Figs. 93, 94, and 95).

Exercises for extension of the knee may consist of standing, sliding-seat, or ladder exercises. The knee is extended with all the rapidity of which patient and masseur alike are capable. These and similar manœuvres should only be attempted when the amount of unrestored movement is very minute. If attempted in the earlier stages disaster in some form or other is almost certain to follow.

When a joint is practically rigid, or when movement is limited

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by what seems clinically to be a solid block from any cause, nothing but prolonged tension or pressure will effect a cure. This may be supplied by splintage or by the use of a sling, with a measure of success that is quite unattainable by massage or manipulation, for the simple reason that the force thus supplied is constantly acting throughout the twenty-four hours instead of being applied for, at the outside, a forty-eighth part of that time.

One point always to bear in mind is that a joint may appear to be stiff simply because the muscles controlling it are wasted. It is no uncommon thing to find abduction of the arm limited to the amount that can be effected by rotation of the scapula, owing to inability on the part of the deltoid to assist in the movement. Restore the strength of the deltoid, re-educate it to contract, and full movement of the shoulder may follow without difficulty.

The treatment of adhesions has already been dealt with under different headings. Here all that is necessary is shortly to recapitulate. Adhesions are composed of connective tissue, either the white fibrous or yellow elastic. The former are usually articular or peri-articular, and should be broken down by the surgeon whenever possible (see the following chapter). The latter are to be found in any extensive scar formation, and may be peri-articular. It is probably rare for this form of tissue to develop within a joint unless infection has been pronounced. Then the formation may be so marked that a fibrous ankylosis is present. Yellow elastic tissue calls for slow gradual stretching ; sudden strain will fail to secure benefit and may serve only to irritate.

If attached to bone, no tension must be laid upon an adhesion until its bony attachment has been freed. There seems to be a sort of latent instinct in scar tissue which tells it that it is serving a definite purpose. If the tissue is attached to bone, this purpose is to inhibit movement, and, the more effectively to attain this end, it responds by development to the stimulation produced by any attempt to force movement. Thus the more we try to stretch it by movement the stronger it becomes. The first principle, therefore, in treating an adhesion with a bony attachment is to free it from the bone by manipulation, and to encourage active contraction of the muscles in which the scar

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is situated. In the meantime movement of the part is limited by splintage or other arrangement to such an extent that no strain whatever is placed upon the adhesion.

The principle of enforcing rest in the treatment of scar tissue is not fully appreciated. Many scars that fail to respond to massage treatment will loosen out materially if the whole part is kept at rest in a plaster splint. Thereby we may learn two principles in treatment : first, to beware of irritating any scars or adhesions, particularly if they are attached to bone ; second, never to be reluctant to admit that a scar is not loosening



FIG. 96.—To show flexion of fingers by constant tension, the hand being placed in a glove.

properly, as there is an alternative treatment, viz., absolute rest in plaster. Needless to say, this does not apply to scars which have not yet healed, and it should be regarded as an exceptional measure rather than be used as routine. The loss of muscular power and the means for its restoration are dealt with in a subsequent chapter (see Chapter XVIII.).

There are four types of case in which fixation may prove beneficial. If the distal ramifications of a scar are still vascular, manipulation may tend to act as a counter-irritant and so set up a chronic hyperæmia, which ends in the formation of yet more scar tissue. Enforced rest allows devascularisation to take place, and loosening is then a comparatively simple matter.

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There is no way in which the sources of trouble mentioned can be detected, except the failure of treatment to produce the improvement expected. Fixation should not be prolonged.

The second type of scar that may benefit from fixation is that in which, let us say, a wound has involved the whole of the dorsum of the foot, and skin, fasciæ, and tendons are bound down in a single rigid mass to the metatarsals. Massage treatment is tedious, and often unproductive, whereas after a period of



FIG. 97.—To show flexion of elbow being secured by use of the "cuff and collar." This shows how the elbow can be fully flexed and supination secured.

fixation the toes may begin to move of themselves. In other words, the tendons have succeeded in "pulling through" the scar. Massage can then materially hasten the restoration of function.

The third type of scar for which fixation may be given a trial is that which follows an extensive wound of the muscles. It appears as a deep sulcus on the surface, and movement of the muscles is a source of pain. If the muscles are placed at rest they waste, and then it may prove a comparatively simple

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matter to build up, as it were, scar and muscle together. Explanation is difficult, but the fact is undeniable.

The last type of scar that benefits by fixation is that which involves the joints or the peri-articular structures. The fixation is accompanied by constant tension, as when we try to straighten an elbow, finger, or knee on a splint, to flex the fingers by means of a glove (see Fig. 96), or the elbow by using the "cuff and collar" method devised by Robert Jones (see Figs. 76, p. 150, and 97).

## CHAPTER XVII.

### FORCED MOVEMENT—"BONE-SETTING."

ALTHOUGH the manipulation of joints under anæsthesia does not in any sense come under the heading of "massage," yet I have been tempted to include the present chapter here. It is an article which I wrote for the *Lancet* and which was published on February 7th, 1920. The whole subject of the treatment of the after-effects of injury is interwoven with that of the administration of forced movement, and this in turn is intimately connected with the art of what is commonly known as "bone-setting." The principles which underlie the administration of forced movement in the massage-room are very similar to those that should control forced movement under an anæsthetic. I am constantly asked to expound the principles of "bone-setting," to explain as far as I may why the quack "bonesetter" is able to flourish so exceedingly, and to compare the results of "bone-setting" with those of orthodox practice.

The first reflection is that the material on which the "bonesetter" thrives should never exist. This does not mean that the formation of adhesions can always be wholly prevented, but it should be, and may be, very greatly eliminated; and, whenever this is impossible, the adhesions should be broken down at the earliest possible moment.

Speaking generally, it may be said that the "bonesetter" flourishes not because people suffer injury, but on account of the treatment they receive. The doctrine of fixation, rest and splintage is his great ally; his enemy is the treatment of recent injury by mobilisation. Until the time has come when the old teaching of absolute and prolonged rest after injury shall have been supplanted by Lucas-Championnière's doctrine of the scientific combination of rest with mobilisation, the type of disability which fills the "bonesetter's" rooms will never decrease.

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But, do what we may, no amount of skill in treatment will always prevent the formation of adhesions after injury, especially in the presence of sepsis ; and, if they form, it is essential that we should know how to deal with them, and carry out our treatment as early as possible.

It has fallen to me to encounter many of the failures of the "bone-setter," and from them much may be learnt. I have also had the most valuable and, I believe, uncommon experience of witnessing the results of mobilisation under anæsthesia as practised by a very large number of different surgeons—some, as I believe, too conservative, some too drastic. I have also discussed this subject very widely with surgeons on both sides of the Atlantic, and have been able to form conclusions as the result of these varied experiences. In my own practice, I know only too well how often I have withheld my hand when movement under anæsthesia would have saved prolonged treatment, pain, and tedious convalescence. I know, too, why I have been so often tempted thus in the past, and the reason may be summed up in one word—failure. It was only when I realised the cause of failure that I again began to practise manipulation under anæsthesia and formulated the principles which, I believe, should govern the art. Now this method of treatment is a mainstay on which I frequently rely not only to hasten convalescence, but very often to render possible cure of disability.

The cause of my failure in earlier days was dual in origin : first, I did not know what the natural movements of joints were, and, second, I tended to do too much. Because a patient is unconscious he cannot feel pain, but this is no excuse for mobilising a joint indiscriminately. During conscious life, reflex contraction of the muscles that oppose a movement invariably takes place, so as to limit the movement before undue strain is placed upon normal structures. Under anæsthesia this protective reflex is lacking ; and so it behoves us, if we would avoid inflicting injury, to exercise even more care when we approach the limit of movement than we should use were the patient conscious.

Then comes a consideration which I believe to be very generally overlooked, but clinical experience has convinced me

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of its accuracy. This is that adaptive shortening takes place in the body with astounding rapidity, and particularly in the presence of pathological change, even though this change is only reflex wasting of muscle. Each muscle fibre and group of fibres is surrounded by a connective tissue sheath, and this sheath is endowed with the property of elasticity. Deprived of its function of shortening and lengthening, the sheath seems to lose its capacity very rapidly and, for the time being, becomes comparatively inextensible. The whole muscle mass, in other words, has undergone adaptive shortening. Restoration of function alone restores the elasticity. If, then, we imagine that the movement, say of extension of the elbow, has been limited by adhesions in or round the joint for some weeks, it follows that the flexors throughout that time have never been fully stretched. The elasticity of the fibrous tissue which goes to the make-up of the anatomical muscular mass has, therefore, never been utilised to the full extent since the day when adhesions which limit extension first began to form. The result is that the elasticity remains unimpaired only through the range of movement allowed by the adhesions. Beyond this range the elasticity is impaired, or, if the lesion is of long standing, may be almost non-existent. When the patient has been anæsthetised and movement has been performed through sufficient amplitude to rupture the adhesions, all further attempt at movement will tend to place undue strain upon the fibrous tissue, which, as we have seen, has suffered impairment of its extensible properties owing to disuse. Forced movement through the full anatomical range may thus inflict severe injury on the fibrous tissue that has lost the elasticity which is essential for the natural performance of the movement.

The first golden rule in manipulation under anaesthesia should therefore be that no further attempt at movement is to be made in any direction when once a definite adhesion has been felt to give way. If this rule is ignored injury will inevitably be inflicted on the fibrous tissue which forms a large bulk of the muscles which oppose the movement. Movement in other directions may, however, be continued. Two criticisms then arise. First, full range of movement may not have been restored by one manipulation; and, second, we do not know that, because

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one adhesion has been broken, there may not be others which still limit movement. The answer to the first criticism is this. Rupture of a pathological band is practically painless, and the local reaction is mild and transitory when compared with the considerable reaction that follows undue stretching, *i.e.*, spraining, of physiological tissue. There should be, therefore, no interference with function and the voluntary use of the limb after skilled mobilisation, except that due to inelasticity of the fibrous tissue within the muscles, and perhaps a mental incapacity to realise that movement or use, which has hitherto been impossible, is restored. Functional use of the limb will rapidly restore the elasticity either up to the anatomical limit or up to the limit allowed by other adhesions should these exist. If, on the other hand, we have forced movement to the anatomical limit, and have thereby overstretched the temporarily inelastic fibrous tissue, we have inflicted a more or less severe sprain, since normal movement may be excessive for structures which have undergone adaptive shortening. Thus we inflict a fresh injury which may be no less difficult to cure than that which the patient originally sustained.

The answer to the second criticism is that it is better to break down any second adhesion under a second anæsthetic and inflict no further injury, than to break down both at once and inflict an injury which is a potent predisposing agency to the formation of new adhesions. Essentially is the old adage "More haste, less speed" applicable to forced movement under anæsthesia.

The criterion of success after the manipulation should be that the patient has increased function ; loss of function speaks of an error in technique. Unfortunately this is not generally realised ; and many surgeons labour under the delusion that, should the necessity of giving a second anæsthetic arise, they made an error in not doing sufficient on the first occasion. The "bonesetter" suffers from no such delusion, and frequently arranges from the outset to perform a series of manipulations, when proposing to loosen a joint in which there has been gross limitation of movement for a considerable time. His practice is sound ; and we should undoubtedly accept this lesson he teaches. More active harm is done by excessive movement under

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anæsthesia than passive harm by neglect to use this most valuable remedial agency.

The question as to when forcible manipulation should be performed is not an easy one to answer. If the injury has been uncomplicated by sepsis it is probably unwise to proceed until six weeks have elapsed since the receipt of injury. I have fixed this limit for the simple reason that it is by no means certain till at least this time has elapsed that the exercise of the voluntary function of the limb will not restore the movement which is lacking. If sepsis has been present, and if this has obviously played some part in causing the limitation of movement, it is probably unwise to manipulate the part forcibly for several months, three to six, according to the severity of the sepsis. The same applies to cases in which loss of function is due to osteoarthritis and similar causes. I make it a rule also to hold my hand for three months at least in all cases where injury has resulted in the outpouring of an excessive callus formation.

It is not uncommon for attempts to be made to break down adhesions without the aid of an anæsthetic. Provided the limitation of movement is small and the original injury to the joint in question is probably slight, this is quite justifiable. For instance, it is often a simple matter to rupture adhesions in the inferior radio-ulnar joint after a Colles' fracture without an anæsthetic. On the other hand, an attempt to flex rigid metacarpo-phalangeal joints in similar manner is opposed by the full strength of the long extensors in the forearm, and the movement cannot be performed without severely straining and thus injuring them. It should be a guiding rule, therefore, always to administer an anæsthetic whenever we are liable to encounter severe muscular resistance to our manipulations.

The choice of anæsthetic depends chiefly on the skill of the anæsthetist. Nitrous oxide gas suffices if adequate skill in administration is forthcoming, and if the manipulator knows exactly what to do and how to do it. Very few seconds should suffice for the manipulation of most joints, and a skilled anæsthetist can almost always ensure this much at least of complete relaxation with nitrous oxide gas. For manipulation of the hip or back it is wise to use some other anæsthetic, as more time is required for these manipulations than in most other joints.

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The grip employed during manipulation is important. Our aim being to rupture an offending band *and no more*, it is usually wise to use as short a leverage as possible. Then, too, we want to reduce subsequent pain and disability to a minimum; and experience shows that this end is attained better if the adhesions are broken by a single sharp movement than by a slow gradual tearing. Rapidity of movement should be combined as far as is compatible with complete control which checks the movement the moment the objective, *i.e.*, the rupture of the adhesion, has been attained. On the other hand, nothing could possibly represent a greater error in technique than to give a succession of ineffective tugs on the offending band. Once its resistance is encountered, it must be overcome forthwith; once overcome, the movement must instantly cease.

Hutton's statement that force in pulling or pushing is valueless, but that "the twist is the thing," gives the key to manipulations of most joints. The whole art is the knowledge of what precise "twist" to administer to each individual joint.

The first thing to ascertain definitely is what movement or movements are limited or give rise to pain, and it is usually wise to compare the mobility of the sound limb with that which we are about to manipulate. Then, directly the patient is relaxed under the anæsthetic, every movement which the patient can perform freely and voluntarily is carried out rapidly. If any resistance is encountered we know the patient is not relaxed, and await a more propitious moment for breaking the adhesions. Once relaxation is assured, the joint is moved firmly and steadily past the obstruction. If movement has not been limited, but only painful, full movement through the anatomical limits should be performed in all directions. If movement has been limited, only those movements which have previously been free and painless may be performed to the full. As we pass the limit set by adhesions, one of two things will be noticed: either there will be a sharp crack or click or a dull tearing, often felt rather than heard. Instantly manipulation becomes more guarded, and is carried on only sufficiently to feel that free movement is now possible past the point to which it was formerly limited. The manipulation then ceases in the direction chosen

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and the process is repeated in any other direction in which movement had previously been limited. Nothing whatever is to be gained by repetition of movements in any direction, if those already performed have been carried through with necessary exactitude. To repeat a movement is a confession of doubt as to the skill with which our performance has been carried out.

The patient is allowed to come round and, as soon as possible, is called upon voluntarily to perform the movement which has hitherto been limited. If the movement is performed more freely or with less pain, the manipulation may be regarded as having been skilfully performed ; if it is more limited or if pain persists for more than, say, half an hour to an extent that limits voluntary activity, then we must have grave doubts as to whether we have not been over-zealous. It is essential that properly devised exercises should be prescribed forthwith, and that these should be faithfully carried out. If any period of rest is necessary after the manipulation on account of pain, the whole success of the proceeding is jeopardised.

If the limitation of movement has been due to dense muscular adhesions, or to adhesions within tendon-sheaths, an alternative course is open to us. If we proceed as already indicated, very little progress will be made and frequent repetition will be essential. As it is usually unwise to repeat manipulation within a week, this means a prolonged and tedious recovery. It is well, then, to have an alternative method of treatment, and this is to be found in free manipulation followed by immediate fixation in plaster over *very* thick padding. The reaction is intense and pain acute, usually for several days, and nothing except morphia suffices, as a rule, to secure sleep. The plaster should be left untouched until the pain is definitely easing off, which usually means a delay of several days. Then it is cut sufficiently to allow the part to be massaged while still resting on the padding on the surface opposite to our manipulations. Pure relaxed movement is then performed, as for recent injury, in the direction opposite to that in which the limb has been fixed ; the original posture is next restored, and the portion of the plaster removed for the manipulation is replaced in position and fixed there rigidly by adhesive plaster. The retentive apparatus is usually

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required for four weeks, after which it is discarded by slow stages.<sup>1</sup>

A few details regarding the essentials to be noted when moving individual joints call for special emphasis.

When dealing with *the shoulder* it must be remembered that few people can, when recumbent, touch the side of their face with the surface of the arm by movement solely in the horizontal plane. The limit of normal movement in this direction depends on the position of rotation of the head of the bone, and the widest range of abduction is reached when the internal epicondyle faces directly forwards. Even so, full abduction is rarely possible without a small degree of flexion. Movement in the horizontal plane may be performed until the angle between the arm and the neck is some  $30^{\circ}$ ; the limb then requires to be carried forward before it is dropped back nearly into the former plane resting against the side of the head. Neglect of this precaution only tends to strain normal structures, and, should the surgeon imagine that the normal limitation of movement is pathological, a very severe sprain will be inflicted. After abduction movement has been performed, the elbow is flexed to a right angle and carried forward across the chest. External rotation is performed in this position, but natural movement ceases considerably before the forearm is vertical.<sup>2</sup> Abduction is then performed, combining this with both external and internal rotation, and the elbow is carried round the base of a cone of which the head of the humerus forms the apex. Until the abduction is just short of a right angle the scapula should not have moved; if it has done so it is well that an assistant should check it by pressure on the axillary border. The movement proceeds until an offending band is felt to give or until the movement has been completed as already indicated. The patient is then rolled on to his side and internal rotation is carried out until the posterior aspect of the second

<sup>1</sup> See Chapter XXXII.

<sup>2</sup> During external rotation it is not uncommon to detect a succession of "snaps" during the movement. Whether these represent the rupture of a series of adhesions or not, I do not know. If abduction has been freed they seem to offer little or no impediment to movement, and no tension—as of stretching the elastic tissue component of the muscles—is felt. However this may be, they can be ignored unless one of them follows the rupture of a band that has afforded definite impediment to the movement.

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finger rests vertically upon the spinous processes between the scapulae.<sup>1</sup> Movement in any given direction ceases the moment any definite obstruction has been overcome. Only one other detail calls for emphasis. It is well to guard the biceps tendon with the thumb as it rests in the bicipital groove throughout the manipulation.<sup>2</sup>

When manipulating *an elbow* one special precaution is necessary which does not apply to the treatment of other joints. Here, too vigorous treatment is liable to meet with a disaster which is not likely to be encountered in other situations. If there has been a recent fracture in the neighbourhood, an excessive outpouring of callus is very liable to take place; while, if no fracture has previously been present, vigorous movement is liable so to damage the bone that a similar disaster is likely to follow. The greatest caution is needed when manipulating an elbow in a patient who has recently sustained a fracture through the olecranon fossa, fracture of the anterior part of the head of the radius or a dislocation of the joint, even though X-ray examination reveals no evidence of injury to bone. After fracture of the olecranon,<sup>3</sup> a T-shaped fracture into the joint, or oblique separation of part of the head of the radius, less caution is called for. No special laws govern the performance of flexion, though the existence of the "carrying angle" must be kept in mind; but when extension is limited, two points of paramount importance must be regarded. First, every care must be taken to prevent the head of the radius from being pulled forward. This can be done by exerting backward pressure with the thumb over the head of the bone throughout the manipulation. Then, second, it is essential to note that the movement is performed with due respect to the "carrying-angle." Unless this is done the lateral ligaments on the outer side of the joint are sure to suffer severe

<sup>1</sup> The range of movement possible in every direction at the shoulder-joint varies greatly. It is most important, therefore, to compare the mobility of the two shoulders before the manipulation.

<sup>2</sup> It is a common event during the manipulations to feel adhesions within the sheath of the tendon give way. To ensure that the tendon is free, the elbow should be fully extended and the forearm supinated while the shoulder is also in full extension.

<sup>3</sup> This refers to a fracture which has not entailed wide separation of fragments, *e.g.*, a star-shaped fracture. If there has been wide separation, or if an operation has been performed to unite the fragments, great caution is called for.

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injury. Full extension should, of course, be secured in full supination. Far better is it to do too little when manipulating an elbow than to do too much.

Manipulation of the *radio-ulnar joints* requires attention to the fact that the movement at the lower joint differs from that at the upper in so far as it is not a pure rotation. As the lower end revolves from supination to pronation round the head of the ulna, it simultaneously glides forward. It is always well, therefore, to free the antero-posterior movement which is possible at this joint before forcing rotation. This should then be performed with firm backward pressure over the lower end of the radius for supination, and with forward pressure during pronation.<sup>1</sup> The hand on the front of the wrist in this case exerts its pressure over the region of the lower end of the ulna. Unless this antero-posterior movement is secured, the posterior ligament of the inferior radio-ulnar joint is liable to suffer severe damage during forcible pronation, and the anterior ligament during supination. If the obstruction is at the upper end of the radius care must be taken lest we inflict injury which will excite callus formation.

The *wrist* is a difficult joint to deal with, as there is so much, as a rule, that requires to be done. The amount of flexion and extension that is possible varies in each individual. It is essential, therefore, to examine the mobility of the sound wrist. Pure ulnar and radial deviation are well marked and often of wide range, but (and this point is often missed) there is a very considerable amount of true rotation possible independent of the radio-ulnar joints. Finally, there is not only the radio-carpal joint to consider, but, even more important very often, there are the joints between the inter-articular fibro-cartilage and the head of the ulna above and the carpus below. In full pronation these joints are, to all intents and purposes, locked ; but in supination there should be very considerable antero-posterior mobility. The loosening of these joints is often all that is necessary in order to restore perfect function to a practically useless limb. Unless they are freed no amount of manipulation of the wrist will ever restore freedom of movement or function.

Manipulation of the *hand* is a somewhat lengthy process, but

<sup>1</sup> For this manipulation the grip shown in Fig. 80, p. 157, is useful.

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it should be possible to do all that is necessary under gas. Yet time is sure to press, and it is well to have a regular routine in mind so that nothing may be missed. The first carpo-metacarpal joint is freed by grasping the thumb and exerting full tension in the long axis of the metacarpal. The digit is then carried into full abduction posteriorly and is swung round into full opposition. Great care is necessary to avoid torsion at the metacarpo-phalangeal joint during the movement. The joints between the bases of the remaining metacarpals are next freed by exerting a posterior pressure on the head of one metacarpal and anterior on the next adjacent, and then reversing the movement. Each pair is dealt with in turn.<sup>1</sup> Having done this, we ensure that our objective has been secured by forming the posterior convex arch which the heads of the metacarpals can assume and flattening it out again.

Manipulation of the *digits* is frequently mismanaged. It cannot be emphasised too often or too strongly that the metacarpo-phalangeal and inter-phalangeal joints are not pure hinge joints. A marked gliding element is present, and, unless this is regarded, the posterior ligament and probably both lateral ligaments will be torn during forced flexion. Considering the metacarpo-phalangeal joint as a type, in full extension the base of the proximal phalanx rests upon the extreme distal extremity of the articular surface of the metacarpal. If hyper-extension is possible it rests towards the posterior aspect. In full flexion, on the other hand, the situation of the base of the phalanx has shifted very considerably, and it now rests well down on the anterior surface of the bone. The nature of the manipulation required is now manifest. Little or no attempt is made to *bend* the joint. The digit is grasped firmly, and longitudinal tension is applied. Abduction and adduction of the phalanx on the metacarpal are first given in each direction, then rotation is performed with the joint very slightly flexed. The lateralisation is given in full extension, but rotation is very limited in this position and only becomes free when a minute amount of flexion has been added. Then pressure is exerted anteriorly on the head of the metacarpal and posteriorly over the base of the phalanx. Instantly flexion begins.

<sup>1</sup> See Fig. 37, p. 78.

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The direction of the pressure over the back of the base of the phalanx alters and tends to follow the base of the bone round the head of the metacarpal until it is exerted directly in the long axis of the metacarpal when full flexion is reached. The movement should partake far more of the nature of movement of the head of the metacarpal on the phalanx than *vice versa*. The wrist, of course, should be kept in dorsi-flexion throughout. Extension is performed by reversing the process. In this way only can the ligaments be saved from tearing. At the proximal inter-phalangeal joints the tendons of the interossei are thus saved from damage—an accident which I have seen lead to almost irretrievable injury. Each joint in each digit is treated in similar manner. It is fatal to force full movement if rigidity has been serious or of long standing, or if it is in part the outcome of sepsis. In these cases movement should be performed in each direction just past the "dead point" and no more. Even though the amount of movement gained is minute, still it is enough; and it paves the way for greater gain at a subsequent manipulation. If too much is attempted the last condition of the patient is sure to be worse than before the manipulation. It is hard to avoid doing too much.

The manipulation of the *hip* should always begin with rotation. This is performed with the limb lying in full extension on the couch. The knee and hip are then flexed simultaneously until the sole of the foot rests on the couch as near to the buttock as is possible, or as near as the foot has travelled after obstruction has been overcome. Abduction and adduction follow in this position. Then the limb is grasped,<sup>1</sup> and rotation is again performed in the flexed position, followed by circumduction as the joint is extended. The hip and the first carpo-metacarpal joint afford examples of joints which, when stiff as the result of old-standing osteo-arthritis, offer the most encouraging prognosis in treatment by manipulation. The course of the disease is not altered, but mobility is frequently increased and pain diminished. Needless to say, manipulation performed during the active stages of the disease leads to disaster.

The most satisfactory position for the manipulation of the *knee* is with the patient recumbent in such a position that the

<sup>1</sup> See Fig. 35, p. 77.

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end of the couch can be lowered from beneath the posterior aspect of the limb as far as the level of the junction of the middle and lower thirds of the thigh. The first essential step is to ensure that there is free lateral mobility of the patella. If firmly fixed, a not very severe strain will sometimes suffice to cause a transverse fracture. Flexion is then performed either to the limit of movement or until an adhesion has been felt to yield. A firm grip is then taken by the disengaged hand on either side of the joint just above the two tuberosities of the tibia, and the leg is rotated alternately inwards and outwards as extension is once more restored. Still maintaining this grip to guard the semilunar cartilages, the last few degrees of complete extension are added with firm pressure, so as to ensure the full locking of the joint by the final rotation of the tibia on the femur. Great care should be taken to ensure that there is no sudden jarring when the full extension is reached, otherwise the internal semilunar cartilage is liable to be injured.<sup>1</sup>

The *ankle joint* presents no special features from the manipulative point of view, save only that we must remember that little force usually suffices to effect our object and that the external ligament is very easily sprained. The chief difficulty is that the manipulation is most easily performed if the knee is flexed. Hence the best position for the manipulation is with the leg dependent over the end of the couch, or, failing this, with the patient prone and the leg vertical—a position none too easy to secure under gas. It should be remembered that flexion and extension take place in an unexpected plane, namely, in a position of apparent slight eversion. Dorsi-flexion, moreover, should be performed by tension downwards on the heel, and not by pushing upwards of the metatarsal heads. If we rely on this lever for our force, the joints in the anterior part of the foot are almost sure to be strained. There is only slight lateral mobility in the ankle joint, and this is in acute plantar-flexion. The adhesions that follow a sprained ankle commonly do not yield to manipulation of the ankle only. If the tendon sheaths of any of the tendons that pass from the leg to the foot have

<sup>1</sup> Under anaesthesia, with the patient recumbent, the femur is not likely to rotate on the tibia. The latter must be manipulated so that full rotation takes place upon the former.

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been involved it is usually necessary to add manipulation of the foot joints simultaneously.

The *joints of the foot* when stiff from osteo-arthritis afford a worse prognosis as the result of manipulation than any other. Indeed, increase of mobility may yield only increase of pain on walking. On the other hand, if the disability has followed trauma and the joints are free from disease, results are frequently secured only less "miraculous" than those that follow manipulation of a knee, in which mobility has been perfect and the disability limited to occasional pain or sensation of weakness. The ankle should, in the first place, be locked in dorsiflexion, and the os calcis is then lateralised by a firm grip on the heel. The inter-tarsal joints are next dealt with by performing a kind of wringing movement of the fore part of the foot upon the hind part. It is not enough to secure eversion and inversion of the foot at the sub-astragaloid joint; definite rotation (almost pronation and supination) of the fore part of the foot is possible. The base of the first metatarsal is endowed naturally with considerable mobility on the internal cuneiform, and particularly in the directions of dorsi- and plantar-flexion, and attention to this joint will frequently transform a well-nigh helpless cripple into one who can walk freely without pain. The laws which govern manipulation of the joints of the hand all apply with equal force to those of the foot. One small detail is perhaps worthy of notice. It is not uncommon for the "bone-setter" to claim that he cures flat feet by manipulation. To this extent perhaps he is right, that flat foot in itself is not usually a disabling condition; it is only when mobility between the joints is impaired that pain and disability are present. Otherwise surely every ballet-dancer should be completely crippled! A "bone-setting" operation may therefore cure the pain of an early flat-foot case; it does not cure the condition. So, too, the claim is sometimes made that cases of metatarsalgia can be cured by manipulation. Again there is a germ of truth hidden beneath an unlikely statement. Sometimes it will happen that a patient with this trouble will trace its origin to a definite occasion on which he trod on a pebble, or walked over cobbles in thin shoes. His pain may be that of metatarsalgia; but, on examination, the anterior arch is not found to be

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“broken” unduly and there is no pain on pressure, only on movement. Then manipulation offers every prospect of cure, as the trouble has originated in a simple traumatic arthritis. Anæsthesia may not be required for the “cure.”

Little need be added on the subject of breaking down adhesions that are due to trauma of muscles or of tendon sheaths. The chief thing to remember is that no harm is done by doing too little; severe injury is always inflicted if we do too much. Repetition of the manipulation is also frequently advisable.

One word remains to be said concerning the so-called “traumatic lumbago.” The victim is not a malingerer, though often he is dubbed as such. The disability is very severe; if the origin is due to adhesions following rupture of a few muscle fibres, the treatment fortunately is easy and usually satisfactory. The patient is given a general anaesthetic, and is placed fully recumbent. The hip of the less painful side is fully flexed into the abdomen and is again placed by its fellow. The process is repeated on the opposite side. Then both hips are flexed together on to the abdomen, flexion of the knee in each instance coinciding with the flexion of the hip. When the anterior surfaces of the two thighs are as far as possible in contact with the abdomen, the sacrum is raised well away from the couch. The pelvis is then waved freely from side to side as the extreme flexion is slowly relaxed and rotation of the spine is performed. When lateral movement is no longer possible without dragging the sacrum from side to side on the couch the patient is placed fully recumbent once more, and the hands are passed round the trunk till they meet in the mid-line behind. Then firm traction is exerted forwards as if attempting to raise the whole weight of the body. A considerable arching of the back is thus secured, and lateralisation is administered as the traction is relaxed and the recumbent position is slowly restored. “Traumatic lumbago” is frequently due to a slight tilting of one ilium on the sacrum. The pain can be relieved almost spontaneously by treating the patient prone. One hand is placed over the region of the posterior superior spine and exerts downward pressure, while the other forcibly pulls the thigh backwards. The cervical region is sometimes affected in similar manner, or

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symptoms (neuralgic pains in the back of the head and neck and even brachial neuritis) may be described in the absence of a history of definite injury. There is no call for anæsthesia for the performance of the manipulations. The patient is placed recumbent with the head and neck projecting freely over the end of the couch. The head rests on the manipulator's hands, and the main point that calls for attention is that tension should be given by securing a firm grip either of occiput and mastoid on each side with one hand, or of occiput with one hand and chin with the other—a grip corresponding to that of the collar in ordinary head suspension—before the movements of flexion, extension, lateralisation and rotation are performed.

At the other end of the spine we meet with that troublesome and often intractable complaint, coccidynia. Sometimes this can be relieved by manipulation, and sometimes it fails. The forefinger must be passed into the rectum, and each joint is then manipulated in turn. In addition to the pure flexion and extension a slight twisting movement should be added. Care must be taken not to be too severe in carrying out the manipulation.

There is no "mystery" in the art of "bone-setting." Certain details require attention and nothing more. We must know what the natural movement of the joint is, we must realise its limits, we must avoid laying any strain whatever on any normal structure—under anæsthesia there is no protective reflex to save it from harm—and all will be well. But under anæsthesia nothing is more simple than to damage normal structures, and then we have to face the unpleasant necessity of dealing with a sprain of our own creation. It is often an easy matter when administering forced movement without an anæsthetic to strain severely any muscle which is thrown into reflex protective spasm during the manipulation.

If our object is to relieve pain or secure increased mobility, we have failed if either of these two objects fall short of attainment. In mobilisation under anæsthesia we have very often an excellent example of the fact that in many cases we do not cure, but depend on the patient's voluntary co-operation before the end is achieved. Manipulation will often suffice to cure pain alone, but it is rarely enough to restore movement. After mobilisation

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the patient must be taught how to improve his mobility as the result of voluntary effort, and without skilled teaching and cordial co-operation the whole procedure may be rendered void and of no effect, for the adhesions will quickly re-form. It is for this reason that severe pain after manipulation should be regarded as an indication of failure. The pain inhibits voluntary action, and without this recovery is well-nigh hopeless. Unless the patient owns up to greater comfort or more freedom within an hour or so of the manipulation, too much has probably been done.

The application of the principles already laid down to manipulation in the massage-room is simple.

In the first place, the anæsthesia of forcible manipulation has as its object relaxation of the antagonists which oppose the movement we wish to perform. In massage this place is taken by "active relaxation." As soon as pain is felt this relaxation is supplanted by reflex spasm of the antagonists, which can only be abolished by calling upon the muscles which control the movement to contract. This, of necessity, causes reflex relaxation of the antagonists. In the massage-room, therefore, forced movement should always partake of the nature of assistive movement. Far better is it to assist the action of a muscle than to attempt to stretch or tire out its antagonists. There should be no excuse for confounding forced movement with passive movement. The latter can only be administered when the muscles are in a condition of complete voluntary relaxation, and when there is no perceptible obstacle to movement.

The laws which govern the direction in which manipulation is to be given are, of course, identical in the two cases. Only one word is necessary. When applying tension the greatest care should be taken not to let the grasp slip. The grip, in other words, must be very firm. The manipulation must be performed smoothly and with even pressure; there must be no aimless wagging to and fro and no spasmodic jerking. The pressure must be released as smoothly and gradually as it was applied.

In order that the patient may be in the most favourable attitude to contract his antagonists, the position in which he is placed in the massage-room as a preliminary to the administra-

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tion of forced movement is not always identical with that chosen when the manipulation is to be performed under a general anæsthetic.

Thus, for instance, flexion of the knee is often best performed with the patient on his face, and the foot is often manipulated to best advantage while the leg rests on the masseur's lap.<sup>1</sup> Shoulder and elbow are best treated absolutely recumbent.

The after-treatment of cases which have been treated by mobilisation under an anæsthetic varies with the condition found. Restoration of function being the objective, active movement must be prescribed at the earliest possible moment. This should be within a few hours of the manipulation, and if possible within a few minutes. But all manipulations must be regarded in the light of the infliction of injury. If pathological tissue has been broken down—the picture is far different if it has been severely stretched only—the injury as a rule is trivial, and we can proceed apace. If pathological or normal structures have been stretched, reaction varies with the amount of damage done. It may only be very slight. On the other hand, if manipulation has been too vigorous, or if it has been unskilfully performed, then the structures around the joint—ligaments and tendons—and the muscles that control the movements of the joint have suffered injury which may amount only to slight strain, to sprains of all degrees of severity, until finally we come to the by no means unknown catastrophes, torn muscles, tendons or ligaments, or even dislocation and fracture. Obviously treatment must vary with the extent of the damage done, and this can only be gauged by reaction. To expect a masseur to put a joint through its full range of movement merely because this has been done under anæsthesia is utterly preposterous, unless, indeed, we have the certainty that no strain has been placed on any non-pathological tissue. So rarely, however, is this the case that the full range of movement is rarely attainable for two or three days unless there was little or no previous limitation. Each case must be treated individually, and the laws which govern all treatment of recent injury must be respected.

<sup>1</sup> See Fig. 34, p. 76; and Figs. 32 and 33, pp. 74 and 75.

## CHAPTER XVIII.

### THE RE-EDUCATION OF MUSCLE.

ORDINARY physical fitness in a muscle is maintained by numerous small contractions and not by violent effort. The latter, if scientifically utilised, can further develop a particular muscle, and can also add to the bulk and strength of any individual muscle group. It is a rare event in daily life to contract the hamstrings to their full extent, and yet their strength and vitality are maintained by the constant contractions and relaxations of small amplitude which they perform in the ordinary process of walking. This illustrates a law of nature which must always be kept in mind when attempting to restore the strength of a weakened muscle.

If a muscle is called upon to perform the full movement of a joint when its power is inadequate to accomplish it, not only will it fail in the attempt, but it will also suffer so severely from fatigue that its efforts in the immediate future will be still further limited. Let us suppose that a patient with a weak deltoid can just raise the extended arm to the horizontal. The performance is gone through with great struggles ; and, when completed, the arm drops to the side and prolonged rest is required. If a second attempt is made immediately, the muscle executes a few spasmodic twitches, the arm is elevated only a few degrees and falls helpless to the side again. But if, instead of being told to move the joint through its full range, the patient is instructed to perform the movement up to, say,  $15^{\circ}$  short of the horizontal, it is probable that it will be carried out five or six times without strain or any need for subsequent rest. It is obvious which of these two methods of exercising the muscle is best calculated to restore its strength. The first law in treatment therefore should be “little and often.”

Every muscular contraction that takes place, unless it is purely reflex, entails the use of a large number of nerve elements

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as well as that of the centre of volition. From the ideational centre an impulse passes to the motor cortex, thence to the medulla, the cord, the anterior horn cells, the nerves, and finally to the neuro-muscular element, which then records the visible result of the impulse in the form of movements of the muscles. In addition, the linking up with the cerebellum controls the movement and co-ordinates it. To secure voluntary movement each link in this chain must be in working order, and it is the masseur's duty to discover if any bar to freedom of movement is due to the weakness of any link.

The highest centre of all, the moral centre, may be at fault and we find the malingerer; the potential of the ideational centre may be lowered as the result of fatigue and we have to deal with a neurasthenic. If this centre is diseased, hysteria or psychasthenia is the cause of the inability to perform voluntary activities. Somewhere lower down there may be a break in the continuity of the chain, and the patient may literally have forgotten how to get the impulse through from brain to muscle. This condition is frequently encountered after prolonged immobilisation, when so-called "sling atrophy" has become an established fact.

The first step in the re-education of such a case as this, or indeed in all cases where muscular disuse is a marked factor in causing disability, is to centre the attention of the patient on one muscle or muscle group. He is told, for instance, to look at his hand, which is held supported before him. The command is next given to raise the hand to the mouth, and instantly the movement is performed quite slowly by the masseur. At first, perhaps, no perceptible contraction will take place in the brachialis anticus, but it is an elastic structure, and the fact of raising the hand must cause the muscle to shorten. The patient is next told to allow the hand to drop on his lap, and it is slowly allowed to do so. The process is repeated three or four times, with a minute's pause for general massage of the arm. Then the patient's attention is called to the brachialis anticus, and while the masseur's one hand controls the movement, the first finger of the other hand taps on the centre of the arm and the order is given to "tighten this muscle" as the hand rises. Presently a twitch will be noticed, and the patient's

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attention is called to it and he is instructed to do it again. From this point onwards all is plain sailing, but the process of self-suggestion is one which needs to be applied throughout all the earlier stages of treatment. A patient may often appear to be incapable of performing a certain movement, but show him the tendon of the muscle that controls the movement and tell him to make it stand out, or tap on the belly of the muscle and tell him to contract at that point, and quite often the movement will be performed without difficulty. It is often of great assistance to carry out the identical process in the sound limb ; in fact, it is often essential.

The great danger in the early stages is to overdo things and try to rush the recovery. Fatigue has the same effect on a weakened muscle that we expect to find when "flogging the tired horse"—both alike suffer severe injury. In prescribing exercises for patients with heart disease, we aim at strengthening the muscles of the heart, and never dream of ordering any movement that might give rise to fatigue. If we do, we know the danger, namely, heart failure : let us beware, then, of fatiguing a weakened skeletal muscle, for assuredly the result will be muscle failure. One of the early symptoms is tremor.

Having made two or three tentative trials to secure contraction, whether success has attended our efforts or no, a few minutes should be spent in massage, and then the process may be repeated. This is called by Lovett the "spacing of exercise," and he has called attention to its supreme importance in the *American Journal of the Medical Association*, March, 1916.

As soon as voluntary contraction can be secured in response to the word of command, the patient is instructed to contract the muscle twice or three times every hour after treatment. He may only succeed for two or three hours at first and then fail ; but with a little perseverance he will be able to perform his exercise right through to the time of the next treatment. Then he is instructed to contract the muscle four, five, or six times at each attempt, and as soon as this can be accomplished he is taught to hold the contraction while he counts three, then while he counts four, five, and six during each contraction.

By this time the contraction will be productive of movement, and the limb can now be held in various positions during the

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counting, and then the way is open for the prescription of a more advanced form of exercise. It is at this stage that some form of apparatus is of great assistance.

The first principle in the use of the weight and pulley is to devise an exercise that will allow the muscle we hope to



FIG. 98.—To illustrate an exercise for the brachialis anticus with the weight and pulley. No exertion is imposed upon the muscle; the triceps, however, does considerable work.

strengthen simply to contract and relax without effort—in other words, an assistive movement exercise. For example, in exercising the quadriceps the patient should stand facing the apparatus with the cord attached to the foot (*cf.* Fig. 54, p. 107). He then flexes the thigh with the knee straight and extends the thigh while the knee is flexed. The same effect can be

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secured by using the vertical cord and a knee-stool (see Fig. 52, p. 105). Reduction of weight adds to the amount of exercise given, as the pull of the cord tends to support the weight of the leg. Provided the exercise is devised so that the weights tend merely



FIG. 99.—To show the converse of Fig. 98. The brachialis anticus is now called upon to work ; the triceps is receiving assistance.

to relieve the muscles of the effect of gravity, the exercise may be prescribed freely almost from the start ; but care must be taken lest, by paying too little consideration to this force, we give the antagonists too severe a dose of exercise.

A corresponding exercise for the brachialis anticus may be performed with the back to the apparatus while the horizontal

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cord passes over the shoulder (see Fig. 98). The weights are gradually reduced to a minimum. Next the patient faces about

and then tries to pull the same cord towards him. This should only be done once or twice on the first day, on the next two or three times, while each following day either a weight is added or the patient performs the exercise with increased frequency (see Fig. 99).

So, too, in exercising the quadriceps the patient has only to reverse his position to secure resistive exercise, which is increased daily either by using additional weight, by increased frequency of the movement, or by holding the weights fully supported while he counts during an increasing length of time (see Figs. 53 and 57, pp. 106 and 110).

Presently the patient may be promoted to exercises on the ladder, and in performing these the same gradual increase in severity or in frequency may be made, until the most strenuous of exercises can be performed with freedom. It should be added that, during the early stages, the sound limb does most of the work, next the two limbs share it equally, and then an ever-increasing proportion is thrown on to the unsound limb—now nearly sound once more—until it alone bears the full body-weight throughout the exercise and the patient



FIG. 100.—First position when utilising a door to re-educate arm movements. The patient crawls up with his fingers as high as he can. Note that the door is fixed by the patient's foot.

performs his knee-bending and stretching exercises while the sound limb is held behind, away from all support.

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The skilful blending and graduation of exercises is a task which would appear to be perfectly simple ; in practice it is the rarest possible event to find a masseur who will perform it con-



FIG. 101.—Second position when utilising a door to re-educate arm movements. The body is moved nearer the door, the hand drops slightly, and the elbow bends. The head is dropped forward.



FIG. 102.—Third position when utilising a door to re-educate arm movements. The body rotates slightly, and the elbow remains stationary, while the hand falls naturally to the back of the head, which is then extended.

scientiously. This is not due to lack of interest, and can rarely be due to lack of intelligence, so the only alternative left is to presume that it is due to lack of comprehension of the importance of re-education and of the wonderful effect of the *gradual*

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increase of exercise. Yet herein is the whole secret of success in the treatment of injury, be it recent or of long standing.

A few words must suffice to indicate other useful points in re-educating a patient in the use of his arm.

For movements of the shoulder "crawling up the wall" does not suffice. A line must be drawn on the wall, and, having reached the mark, the patient must practise raising the hand from the wall. Thus he should have three marks, one showing the level at which he can raise his hand from the support of the wall while he counts three slowly, the next marks the highest position at which he can raise it momentarily, while the third is placed at the spot beyond which he is unable to reach. All should progress upwards daily, and, when the last has reached the anatomical limit, the others gradually approach it till they coincide. A useful exercise has been devised by Robert Jones. He utilises an ordinary door instead of more elaborate apparatus. The three main positions in the exercise are illustrated in Figs. 100—102.

For shoulder and elbow alike various points on the clothing may take the place of the marks on the wall, and exercises with a stick or pole are very valuable. The pole is grasped during the early stages with the hands well apart; as recovery progresses they are approximated.



FIG. 103.—An early exercise with the weight and pulley if the left hand is unable to grasp the handle.

Exercises for rotation of forearm, of shoulder, or of both together, can be graduated by the use of an umbrella, a heavy stick, and pokers of various weights. The elbow may be held fixed against the side of the body or fully extended (see Figs. 70 and 71, pp. 139 and 140). All "half-way" positions should be prohibited. The weapon is grasped

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in its centre during the early stages; and, as strength increases the grasp shifts towards one end while the other projects further and further upwards. The exercise can be made more strenuous by slow performance, the duration of each movement from vertical to horizontal being regulated by counting. Where apparatus is available the first stage is to work at roller or rotator when no weight is attached, ever-increasing resistance being graduated by the use of additional weights. When the weight is fully wound up by the roller, an excellent exercise is to release the ratchet and to control the fall of the weight by friction exerted by the grasp.

To restore suppleness to the fingers nothing can replace natural use. The simplest way to accomplish this is to pad one of the handles of the weight and pulley with a duster till of sufficient size for the patient to grasp. If necessary the sound hand may assist by being placed over the injured member (see Fig. 103). The weight is then increased daily. As soon as this has assumed fair proportions, the weight is decreased during part of the time, the padding is diminished, and the injured hand works unassisted. As soon as the fingers can make any attempt at grasping the bare handle, ladder exercises are prescribed. It is wonderful at times to see a man, who has been unable to grasp anything for months, gradually tighten his grip on the rung of a ladder as his sound arm tires. Nature seems to prompt his maimed hand to work in order to relieve its fellow. No set exercise can be devised that will replace natural use, and no combination of exercises can equal in curative effect the use of a scythe or grass-shears for one whose grip is enfeebled. Grasping various-sized objects and trying to hide them from view in the palm is an excellent exercise, and reference must be made again to Tait Mackenzie's plan of taking up half a sheet of newspaper by its corner and gradually rolling it up into a ball in the palm of the hand.

## CHAPTER XIX.

### THE RE-EDUCATION OF MUSCLE (*continued.*).

IN the previous chapter a general account has been given of the nature of re-education of muscle and also a rough sketch of the course to be adopted when undertaking it. Much still remains to be said, for the re-education of muscle is a distinct art which hitherto has received all too little attention. Indeed, only one book has been published which deals solely with muscle rest, muscle action and muscle training, and this is Colin MacKenzie's "The Action of Muscles."<sup>1</sup>

At the present time there is still a most dangerous delusion which receives wide acceptance. This is that massage has the power of "working up a muscle." By this phrase, apparently, is understood that muscular strength can be restored or developed by massage alone. How utterly fallacious is this view can be shown by two simple reflections. First, were massage able to build up muscle strength, the finest athlete would at once become the one who could afford to employ the best masseur. Then, too, let anyone try to restore strength by massage to a limb which is wasted as the result of hysterical paralysis. No amount of massage will ever restore one iota of power. How, then, has the delusion arisen? Again the answer is quite simple. A patient, let us suppose, has suffered from a long and severe attack of typhoid fever. The lower limbs are wasted to a condition of almost complete impotence. Massage is ordered, and almost at once power returns and muscle is seen to re-develop. The massage gains the credit, and quite rightly, but the massage has only been the means by which the

<sup>1</sup> Published by H. K. Lewis & Co., London, 1918. In October, 1919, Prof. F. Wood-Jones dealt with "the voluntary muscular movements in cases of nerve injury" in his Arris and Gale lecture at the College of Surgeons of England. He therein ascribes a fourfold action to muscles, naming each muscle, according to its action, as prime mover, antagonist, synergist and fixation muscle. (See *The Lancet*, November 22nd, 1919.)

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curative agency has been enabled to perform its task. What really has happened is this. Under the refreshing and invigorating effect of massage—smooth, gentle, rhythmical deep stroking and kneading—the muscles, which have lain passive for weeks, are encouraged to resume their normal functions of performing active movements, instead of continuing in their state of almost complete inactivity. It is this return of function, and this alone, that restores muscle strength and causes muscle development. This is what is meant in the preface when I wrote that massage can assist the recuperative course by reviving the power of spontaneous action. Massage alone, then, is all-insufficient to restore muscle strength ; it can only incite, as it were, muscle activity. By assisting the circulation and the removal of waste products it can also aid a muscle to perform its function more freely than it can without it, but that is all. If a muscle does not know *how* to contract, no massage will ever teach it.

On the other side of the picture we have many and various so-called "systems" of exercise, of which I have selected the Swedish Educational and Remedial on which to pin my faith. These, one and all, presuppose that the muscles can, and do, perform their function ; and even more, that they are fit and able to do so against the resistance of gravity for the most part. But a muscle that has been recently paralysed from disease, from nerve injury, or even if it has only undergone a marked degree of reflex wasting, may be totally unable to perform such a feat. Some system of education, therefore, is required to bridge the gap that exists between the period of complete paralysis or great weakness and the moment when a "set" exercise can be performed according to any of the established systems. This place is filled by muscle re-education.

To re-educate the muscle efficiently several definite principles must be realised and regarded.

*First*, an enfeebled muscle cannot contract unless and until its antagonist relaxes in conformity. The first thing to be done, therefore, is to teach the antagonist this, it may well be, difficult action. The simplest and best way is so to arrange the posture of the patient that gravity will oppose the action

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of the antagonist and assist that of the muscle we wish to train. The former is called upon to contract, and then the latter. If the movement is not performed we know that the antagonist has not relaxed ; for, had it done so, gravity would have performed the movement independently of any assistive action from the muscle we hope to train. Until the movement is performed by gravity, all attempt at training the weakened muscle to contract is useless ; as, if the antagonist has not learnt to relax sufficiently for gravity alone (or for the muscle we are training aided by gravity) to perform the movement, it is not to be expected that the muscle will be able to do so alone when the assistance of gravity has been withdrawn.

*The second principle* is to make sure that the patient's muscles at least know how to perform the movement we hope to see, and that he realises fully what is desired. This can only be done by placing the sound limb in the position we propose to choose for the re-education of its fellow, and by calling upon it to perform the movement possible as the result of the contraction of the muscles we are about to teach. When he has learnt on his sound limb what happens when he alternately contracts the muscle in question and then its antagonist, and that these actions can be done without strain or effort in other muscles or muscle groups—then, and then only, is it safe to make the attempt to copy in the damaged limb. It is often necessary to repeat this demonstration in the sound limb at frequent intervals throughout the training.

*The third principle* in muscle re-education is to ensure that, whatever task we set a muscle to perform (provided it has any power at all), we have every reason to suppose that it can do it ; for enfeebled muscle seems to have this curious idiosyncrasy, that it will not even attempt to do that which it knows to be impossible. Rather will it remain completely flaccid and rely on synergist effort to perform the action demanded by volition. The result is often, indeed, the exact antithesis of what we expected ; for it is no uncommon thing for the antagonist to be thrown into a condition of firm contraction. For instance, if we ask an enfeebled deltoid to abduct an arm which it is totally incapable of moving, the

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usual result is that the deltoid makes no effort whatsoever to secure gleno-humeral movement, but rather the adductors contract so as to do their best to assist the elevation of the arm by means of scapular movement in response to the command from the brain to abduct. It cannot be too fully realised that only movements are represented on the cerebral cortex and not individual muscle action. So it comes about that any impulse starting from the cortex leads to the contraction of muscle groups and not of individual muscles. This is one of the reasons that often render muscle-training after a tendon transplantation operation so difficult. Moreover, muscle action is not the simple thing we often suppose. Synergistic and antagonistic actions are still shrouded in half-revealed mystery. So it is not uncommon, if the muscles involved in "forming a fist" are excessively weak, that, in response to the call to perform the action, the arm is firmly adducted, the forearm is flexed and held rigid, the wrist springs back into dorsi-flexion, the interphalangeal joints are fully extended by the interossei, and nothing whatever happens in the direction of flexion of the fingers. To allow this sort of thing to go on is to impose a well-nigh insuperable obstacle to recovery. The secret of success is dual in character. First, we must so arrange the posture that the action which we wish to be performed can be carried through without undue effort or strain, even if we have to invoke the assistance of gravity in order to eliminate the necessity of synergist action. Second, we must ensure that only two muscle groups act within the limb, namely, the muscle we wish to contract and its antagonist. We must, in other words, strenuously combat the apparently uncontrollable instinct on the part of the patient's muscles to make too great an effort to secure the end in view. An enfeebled muscle is terribly handicapped in its earliest attempts at contraction by over-zealous efforts of other muscles throughout the limb. Effort—strong, persevering, repeated, voluntary effort—is the essential outcome of skilled muscle re-education; but the effort must be properly directed to secure the end in view, and not waste itself in a general wild, spastic activity that will probably suffice to produce any and every action save only the one we desire. If this tendency

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towards waste of energy is not strenuously combated, we often see a chaotic sort of attempt at movement which has led me to refer to it as the result of "confusional insanity of muscle."

*The fourth principle* is to graduate activity so that, when one feat has been successfully accomplished, a second shall be devised which, in its performance, will entail an almost imperceptible, but none the less real, increased expenditure of energy. The simplest and best way is to compel the force of gravity to serve our ends, and this is merely a question of postural treatment in the early stages. For instance, the effort exerted by the long extensors of the wrist in performing dorsi-flexion while the forearm is in full supination is negative. As it passes the mid-position between pronation and supination the zero point is reached and passed, whereas in full pronation the muscles have to work against the full force of gravity.

In our present state of knowledge it is unfortunately impossible for us always to comply with the *fifth principle* in muscle training, namely, always to select as the first movement in training the one action which, in normal life, represents the sole and true function of the muscle. The science of "myology," as MacKenzie calls it, is still in its infancy. He claims that each muscle has one action and only one, and that it cannot perform this action unless the antagonist is relaxed. These claims seem to me to be exaggerated, and I prefer to believe that a muscle has one definite or primary action, but that it may have various subsidiary actions.<sup>1</sup> Thus, when we perform a certain movement, it seems quite possible that this particular effort is performed in the main by some one muscle whilst others may give subsidiary aid and act as synergists. When performing some other movement, one of these may assume the primary *rôle* while the first adopts that of synergist. The subject of synergistic action is terribly involved. A mere glance at a lower limb, for instance, suffices to show that the gluteus maximus, the quadriceps and the calf muscles are synergistic in maintaining the upright attitude. Then, too, there is no doubt that the dorsi-flexors of the wrist

<sup>1</sup> See footnote, p. 238.

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are the most powerful synergists<sup>1</sup> of the long flexors of the fingers, and little question that the radial extensors act as synergists to the abductor minimi digiti. That this synergistic action is a definite reality is shown in all cases of peripheral nerve injury. If a single muscle group is paralysed, and the motor cortex orders the movement to be performed which is usually the function of this group, the paralysed group fails to respond. But, the muscle not being represented on the cortex and only the movement, contraction of other muscle groups invariably takes place, with the not infrequent result that extension will follow the demand for flexion and *vice versa*. Any severe straining to cause the paralysed muscle to act will invariably cause contraction in unparalysed groups, and the greater the strain the more widespread becomes this contraction till, perhaps, every muscle in the limb and even in its unaffected fellow will pass into contraction.

As has been mentioned already, the statement that, when a muscle contracts, its antagonist relaxes is only a partial truth. For instance, it is perfectly possible voluntarily to contract the brachialis anticus without causing flexion of the elbow by merely, at the same time, contracting the triceps with equal force. If the strength of the contraction of the triceps relaxes, flexion takes place ; but the relaxation of the triceps is not as a rule complete. It partakes far more of the nature of voluntarily graduated relaxation, volition controlling it so that freedom of action of the brachialis is controlled. In fact it seems probable that, in ordinary life, stability and co-ordination in movement are dependent on simultaneous action of both the prime mover, as Prof. Wood-Jones calls it, and its antagonist, co-ordinated movement being dependent upon the simultaneous voluntary contraction of the one and relaxation of the other. Once more, then, we see the vital importance of training voluntary relaxation before, or at least simultaneously with, voluntary contraction.

The fifth principle is therefore by no means easy to put into effect, but MacKenzie has shown us clearly the movements in

<sup>1</sup> When fixing the wrist in dorsi-flexion to assist flexion of the fingers, the dorsi-flexors of the wrist are regarded by Wood-Jones as "fixation muscles."

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which each muscle or muscle group acts as a primary agent, and this is the first movement we must encourage it to perform.

*The sixth principle* entails a personal element in training that can only be developed with experience. It consists of the blending of rest with activity. Few things are more inimical to success than fatigue. Sub-maximal effort may, and should, be repeated frequently and at constant intervals through the day, four to six times according to the state of recovery. Maximal effort should be performed but seldom, once only on each occasion at most. This does not mean that progress will necessarily be slow, for the maximal effort of to-day should (and will, if training and response to training are efficient) be sub-maximal to-morrow. It will only be so, however, if the patient plays his part. It should be the first duty of every masseur to explain this to his patient. The most skilful training is void of effect without the obedient co-operation of the patient between the times fixed for definite training. Unless the patient realises this he is apt to rely on his masseur to cure him. This is impossible: there is only one person in the world who can do this, and that is the patient himself, and his curative agent is volitional effort. This he must be made to realise from the outset. What, then, is the part of the masseur? Surely this: he must guide volitional effort to success, realising that unguided effort, however persevering, will either fail to attain success at all, or will do so far more slowly than when efficient aid is given. The guidance is needed in two directions. The patient must be taught what *not* to do, no less than what he must do. He must also be taught how much he may do and how often he is to do it. He must be shown faults, he must be checked if too eager, encouraged if too slack; and these things are fully enough, and more, to satiate the most enthusiastic masseur. Few, indeed, can undertake any great amount of this type of work. Not only is intimate (and unusual) knowledge required; the close attention to *minutiae* is mentally exhausting. If it is not so, we may be sure that the work done is inefficient. It is pitiable, moreover, at the end of a long day to see a masseur giving mere massage—a quite useless performance it may well be—to a patient, because he is too mentally tired to

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give the only treatment that is of any avail, namely, muscle training.

*The seventh principle* that we have to recognise is that, though a muscle may have the potential power of contracting throughout a certain range of movement, it may not have the strength as yet for the sustained effort involved. Under these circumstances it should be taught to contract and perform the first portion of the movement. A short rest follows, supporting the limb in its new position, if necessary, so as to allow complete rest. After a few moments the next portion of the movement can be performed, and so on until the full movement has been accomplished. A method of training a muscle towards sustained effort has been indicated when dealing with assistive movement. (See pp. 94 to 101.)

*The eighth principle* is well known and recognised, viz., that no enfeebled muscle must ever be stretched. This is recognised indeed when certain muscles, *e.g.*, the long forearm extensors, anterior tibial group or deltoid, are paralysed : it is astounding how widely it is neglected in many other instances. Beyond all question the most important single muscle in the upper limb is the *opponens pollicis*, and yet it is rare to find this placed in the "rest position" when paralysed. The neglect to apply splintage to all cases of ulnar paralysis has also been responsible for much evil. The question of splintage is considered later. (See Chapter XXXII.) The interpretation put on this eighth principle is, most unhappily, varied. Some hold that a weak muscle must be kept uniformly in a condition of complete relaxation until it can perform its function. This is irrational, for a muscle mass consists of more than contractile tissue : much of it is merely elastic, namely, all the fibrous tissue in the mass. Deprive this of its physical property of shortening and lengthening, and it will undergo a process already spoken of as adaptive shortening. Then, when recovery has taken place, function is well-nigh impossible. Moreover, we have other things upon which movement, and particularly co-ordinated movement, is dependent. The ligaments of joints and all tendons possess elastic properties. Unvaried relaxation leads to adaptive shortening in these, and function is further impeded. It is useless to have a perfect

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muscle wherewith to move a joint if the joint has been fixed by shortened ligaments on one side, and possibly is even partially dislocated by undue stretching of the ligaments on the opposite side. The elastic property of muscle, tendon and ligament throughout the limb must be maintained, and this is effected by relaxed movement. Further, co-ordination of movement is largely a question of joint-sense, and this must be maintained intact as far as possible from the outset. Relaxed movement, through at least the inner half of the range of movement, should therefore be a daily task to be conscientiously performed. Full movement should be withheld until recovery is well advanced.

*The ninth principle* is always to be willing to own up to having attempted too much. If on any day the power of contraction, or the amount of movement performed is less than that of the previous day, massage and relaxed movement alone should be given, and all voluntary effort is postponed to the following day. If we never do or prescribe too much, we may be sure we are not doing enough.

*The tenth principle* is that we must be sure that we properly instruct our patients in regard to the posture to be assumed between the times appointed for definite activity. These will be indicated as we consider the training of each muscle group.

*The eleventh principle* is one that requires emphasis, as it is contrary to the teaching of certain schools of thought. When a muscle is weak, there is no need to check all action in the antagonist for fear that it should over-develop its strength. This is a theoretical argument and expresses fear of a danger which, in practice, has proved to be a mere phantasm. The only thing that is necessary is so to limit its activity that the weakened muscle is not stretched. In fact, we have seen that one of the functions of a muscle is, so to speak, voluntarily "to pay out the slack" by gradual stages as its antagonist contracts. Let us from the outset, then, cultivate and re-educate this important function in the antagonist. Otherwise we are failing in our task of re-educating co-ordination. This leads us directly to :—

*The twelfth, and last, principle.* Nature has decreed that recovery in any shape or form requires efficient blood supply.

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Cut off activity from a limb in which a muscle is paralysed and we do all we can (short of applying a tourniquet) to cut off the blood supply, and this means depriving the paralysed muscle of its much-needed nutriment. Let us encourage, therefore, the fullest possible activity in all the uninjured muscles in the limb, taking only the one precaution, namely, to prevent stretching of the enfeebled muscle. Thus we can maintain or improve circulation, and the joint and muscle senses throughout the limb, and maintain health, nutrition and co-ordination—and all this in readiness against the day of recovery in the weak muscle. Surely this is rational treatment, and better than leaving a limb to waste and shrivel and to lose all sense of movement and co-ordination. Then when the muscle has once more power to act, so poor is co-ordination and control over the rest of the limb that training may be well-nigh impossible. In addition, both the nerve-paths which convey sensation, and those over which travel the impulses compelling voluntary movement, are capable only of poor conductivity. Disuse atrophy is as hard, and often harder, to cure than atrophy due to injury ; and often, indeed, imposes a greater disability than the original lesion. Let us, therefore, give our weakened muscle the best chance it can get of rapid recovery, and let its first tentative attempts at contraction be performed in a limb that is as nearly perfect as it is in our power to keep it. Let it also find, on its re-awakening into activity, every sense as unimpaired as possible and an adequate blood supply upon which to draw for its re-development.

When we come to consider the muscle training of each particular muscle or muscle group, much space will be saved if we realise at once that the training of one muscle is merely the reverse of the process involved in training its antagonist. Hence much repetition of detail can be avoided. Also, it is no less impossible to describe a process of re-education than to teach the manipulations of massage by written word alone. These things must be demonstrated to be taught properly. All I can do here, therefore, is to indicate the postural element of the training, and this can again be compressed into smaller compass if we once realise that the posture to be assumed in the earliest stages of muscle training is, as a rule, identical with

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that in which pure relaxed movement is administered. (See Chapters VII. and VIII.)

In the earliest stage in training abduction of the shoulder the patient is recumbent and the whole of the upper extremity rests on a smooth couch. If the patient is still wearing an abduction splint, the arm must not be allowed to approach the trunk nearer than a position of  $45^{\circ}$ . The patient is taught to try to abduct a few degrees, then to rest, then to try to gain a few further degrees. Then he is taught to move the limb to and fro on the horizontal plane. As soon as he can do this the trunk is elevated a few degrees by the insertion of a pillow ; and, as recovery progresses, the elevation of the trunk increases till an angle of  $45^{\circ}$  is reached. The remaining stages are more easily passed through if the legs from the knees downwards are allowed to hang over the end of the couch. It must be remembered that the final degrees of abduction can only be performed in the horizontal plane when the internal epicondyle points directly forward. This is not the best position in which to practise the earlier stages of abduction. In the ordinary mid-position of rotation a limit to abduction is reached when some  $30^{\circ}$  more movement still remain, and at this point the arm is carried slightly forwards with a sort of semi-circular sweep to aid rotation, and is allowed to drop backwards by the side of the head. The alternative training by the weight and pulley is first to abduct the arm by means of weights attached to the overhead pulley. As these are reduced, effort is called for to perform the abduction which has hitherto been performed by the weights. When the last weight is removed the patient is ready to perform "free" abduction against gravity. The next stage is to grasp the handle attached to the rope that passes round the floor pulley and abduct again. As the weight is increased, the work now increases in proportion (see Figs. 58 and 59, pp. 111 and 113).

The movement of abduction of the arm is very complicated. The deltoid (and supraspinatus according to MacKenzie) abduct the arm to nearly a right angle at the gleno-humeral joint. Further abduction takes place by movement at the sterno-clavicular joint and is performed chiefly by the trapezius, aided by the levator anguli scapulæ. The serratus magnus

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probably also actually aids rotation of the scapula, but this is not its main function, which is to maintain the contact of the anterior surface of the scapula with the chest wall. Deltoid training should begin at some  $70^{\circ}$  of abduction to  $85^{\circ}$ , that of the scapula muscles at  $165^{\circ}$  to  $180^{\circ}$ . The two processes can be carried on simultaneously. If the serratus only is weak a cuff and collar rest (see Fig. 76, p. 150) will be all that is required. Although synergists in one sense, that of generally assisting abduction, the serratus magnus and trapezius are antagonists in so far as the former tends to pull the scapula downwards and forwards, while the latter pulls it inwards and upwards. The rhomboids draw the scapula inwards and slightly upwards.

The training of the antagonist, the pectoralis major, can only be advanced without the aid of apparatus from the sitting position to the recumbent. To pass further would involve the use of the Trendelenberg position. Thus training with the weight and pulley is preferable when this stage is reached. It is well to remember that the use of the weight and pulley while the patient is recumbent is a most valuable combination of treatment in these, and in many other, instances of muscle training. Doubtless the latissimus dorsi and the scapulo-humeral muscles, except supraspinatus, can act as synergist adductors.

It is not easy to rest a deltoid without the aid of an abduction splint, but most of the strain can be taken off the muscle by use of a sling applied as for fracture of the clavicle (see Fig. 77, p. 151), and a considerable degree of tension can be relieved by resting the hand in the side pocket of a jacket or even in the trouser pocket, by carrying it between the higher buttons of a waistcoat or supported on a simple loop of bandage from the opposite shoulder. The forearm should be flexed to  $45^{\circ}$ . The adductors of the shoulder are in the rest position in the upright attitude.

The training of the *rotators of the shoulder* (MacKenzie describes the infraspinatus and teres minor as external rotators, and the latissimus dorsi and subscapularis as internal rotators) should be performed in the first stages prone for the internal, and supine for the external rotators. In the upright position

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they are free to act in the "zero" position. MacKenzie regards the great pectoral as an adductor only and not as a rotator, and this gives the clue to training. It is, from this point of view, best to regard it as a primary adductor and synergist rotator. The rotators of the shoulder are at rest while the limb hangs at the side, the forearm in mid pronation and the thumb facing directly forwards. If the forearm rests on a sling, while the external epicondyle of the humerus faces directly forwards, the internal rotators are relaxed, the external are in tension.

Flexion and extension of the shoulder should, in the early stages at least, be considered to be the function of the *coracobrachialis* and (according to MacKenzie) the *teres major* respectively. It is wise to regard all the three portions of the deltoid as acting in unison (as the great abductor of the shoulder only, *i.e.*, of the gleno-humeral joint) throughout the earlier stages of training. Flexion and extension of the shoulder should be performed with the arm and forearm resting on a smooth board. In the horizontal plane the action of gravity is zero, as the board is dropped towards the patient's side, movement towards the middle is assisted by gravity, and that away from it is resisted. Depression of the support is continued until the maximum of work is done in the vertical position by one muscle when raising the arm forwards, by the other when raising it backwards. Movement towards the vertical gives assistance from gravity to the muscle that performs the movement. The muscles, of course, are at perfect rest while the limb hangs loosely at the side.

*The brachialis anticus and triceps* should be considered as pure flexor and extensor of the elbow respectively, though the supinator longus acts powerfully as a synergist flexor when the elbow is slightly bent and the forearm is in mid-pronation. The earliest training should be performed with the patient recumbent and the forearm vertical (see Fig. 41, p. 88). In this position the muscles can act from the vertical with the aid of gravity and slightly against gravity through the few degrees on each side of the vertical. When an angle of more than  $25^{\circ}$  or  $30^{\circ}$  is passed, the strength required is very considerable to elevate up to the vertical once more. The

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“zero” position is secured by supporting the arm and forearm on a board whose top is at the level of the armpit. The forearm is then moved to and fro across its surface. As the distal edge of the board is dropped resistance is offered to flexion, assistance to extension (see Figs. 43 to 45, pp. 89 and 90).

In practice, elevation or depression need not be carried further than about  $60^{\circ}$ , though theoretically the process should be continued till the vertical is reached. The final stages can be dealt with by raising the patient from the half-lying to the sitting position. Using the weight and pulley, the middle pulley should be employed, resistance to the brachial anticus being afforded when facing the apparatus and to the triceps when standing with the back to it, the cord passing over the shoulder (see Figs. 98 and 99, pp. 232 and 233).

The position of rest for the triceps is full extension of the forearm while it hangs loosely to the side of the body. To secure rest for the brachialis anticus flexion to something short of a right angle is essential. This can be given by supporting the forearm across the chest, e.g., by passing the hand through the opening in the waistcoat above the top button but one. A loop of bandage serves the same purpose.

The *biceps* should, for the purpose of early training, be considered as a pure supinator of the forearm, though it undoubtedly serves as a synergist flexor of the elbow. It should be trained at first while the patient is recumbent, the elbow flexed to a right angle with the forearm vertical. By raising the trunk slight extra resistance can be given, and then rotation should be practised with varying degrees of flexion and extension of the elbow. It should be noted that, in full extension, the power of the biceps as a supinator is very poor (if indeed it acts at all), the action being performed by the supinator brevis. The pronators of the forearm—*radii teres* and *quadratus*—are the antagonists of biceps and supinator brevis, and are trained to contract in similar manner. To train either supinators or pronators by means of apparatus is not very easy, as graduation of resistance has to be very carefully regulated. The first stage is to wind up a few turns of the rope on the rotator and then release both catches. The weight is made to assist the muscles we wish to train, and to resist the

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antagonists. Reduction of weight reduces the assistance till finally, when no weights are attached, movement is practically "free." The addition of weights to act in the reverse direction then affords resistance. The position of rest for the rotators of the forearm is secured by resting the forearm across the chest as suggested for resting the brachialis anticus. The mid-position between pronation and supination rests both supinators and pronators alike. It is worthy of note that MacKenzie regards the supinator longus as an accessory supinator only and not as a synergist flexor of the elbow.

Flexion and extension of the wrist should be regarded as the functions of the *long carpal flexors and extensors*. When the hand is in full supination gravity will extend the wrist quite easily, if the flexors are relaxed, and *vice versa*. As pronation takes place gravity plays less part, until in the mid-position its action is zero and movement becomes truly "free." Further pronation means extra resistance from gravity to dorsi-flexion. For some time I was under the delusion that the use of the roller apparatus (the patient turning the instrument towards himself) was an exercise for the dorsi-flexors. A patient with a complete posterior interosseous paralysis can, however, perform it with ease. The only muscles that are really involved in the movement are the flexors of the fingers and the triceps. So unexpected are some of the actions revealed by muscle-training! The only incentive to the dorsi-flexors to act in performing this exercise is that of their synergistic affiliation towards the flexors of the fingers. This supplies a key to another method of early training of the carpal extensors, namely, to train the grip of the finger flexors. It can readily be done in any use of the weight and pulley provided the patient stands with his back to the apparatus, and also by ladder exercises provided the grip is taken in supination or on the side bars of the apparatus. The carpal flexors rarely need any definite precaution as regards rest, unless indeed only one is weak. Then a lateral splint should be applied to prevent over-action of its fellow. The dorsi-flexors are best protected by use of the short cock-up splint (see Fig. 161, p. 463). The lateralising action of the carpal extensors and flexors on

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the wrist can be trained by placing the forearm and the palm of the hand flat on a smooth board.

It is well to consider the training of the *flexors and extensors of the fingers together*. The muscle action involved is intricate and is best studied by consideration of the ordinary deformity seen so often (quite unnecessarily of course; its existence indicates neglect in treatment) after paralysis of the ulnar nerve. The metacarpo-phalangeal joints of annularis and minimum digitus are hyper-extended, and the inter-phalangeal joints are fixed in flexion. The extensors of the metacarpo-phalangeal joints are therefore over-acting, their flexors are paralysed: the extensors of the inter-phalangeal joints are paralysed, their flexors are over-acting. The only possible conclusion is this. The extensors of the metacarpo-phalangeal joints are the extensors communis, indicis and minimi digiti; the flexors are the lumbricals. The extensors of the inter-phalangeal joints are not the long extensors, but only the interossei, the flexors of the proximal joints being the flexor sublimis, and of the distal the flexor profundus. All training of the flexors of the fingers should be performed with the wrist dorsi-flexed. The carpal extensors act powerfully as synergists of lumbricals and long flexors equally. The lumbricals are trained while the inter-phalangeal joints are kept in full extension, the long flexors while the metacarpo-phalangeal joints are kept fully extended—the golf-club grip.

The extensors communis, indicis and minimi digiti are trained while the inter-phalangeal joints are kept flexed; the interossei are trained as extensors while the metacarpo-phalangeal joints are kept flexed. When sitting with the elbow flexed to a right angle the flexors receive assistance from gravity while the forearm is in pronation, resistance when it is supinated. The reverse applies for the extensors. The lateralising action of the interossei on the fingers can be trained with the hand prone on a smooth board, though at first light dorsal splints may be required on the posterior aspects of the digits to maintain full extension meanwhile. The long extensors of the metacarpo-phalangeal joints are rested by prolonging the palm piece of a short cock-up splint up to the webbing between the fingers. If these joints are to

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be free to move, the splint must never extend beyond the middle crease of the palm. To prolong the splint to the finger tips, in cases when only the musculo-spiral nerve is involved, is simply to ignore the action of the interossei. To rest the lumbricals a posterior plaster splint bent to a right angle is applied extending from a level slightly distal to the wrist-joint to about the level of the proximal inter-phalangeal joints (see Fig. 164, p. 468). This is usually enough also to rest the interossei. If it prove inadequate it is better to apply light posterior splints to each digit, leaving the metacarpophalangeal joints free to act. The long flexors of the inter-phalangeal joints (*sublimis* and *profundus*) are rested as a rule without apparatus. If active assistance is required, the best plan is to apply adhesive plaster, one end fixed to the dorsum of the distal phalanx and the other to the palm. There is no need to fasten the fingers down tightly. The necessity for and method of, ensuring rest for a weakened *opponens pollicis* has been already mentioned. A slip of adhesive plaster, passing around the thumb and fastened to the ulnar border of the palm, is all that is required. The distal inter-phalangeal joint can be left free if desired and not kept flexed as shown in Fig. 162, p. 465.

The other intrinsic and long muscles of the thumb can be trained on lines similar to those mapped out for the other digits. It is often well to rest the *extensor ossis metacarpi pollicis* by means of a small plaster splint inserted between the index and the thumb. The latter must, however, be kept in a position of opposition (see Fig. 165, p. 468). For some reason, which at present I cannot explain, the lumbricals will often work better when performing their function against resistance than when acting "freely."

The use of apparatus for training the muscles of the hand and fingers is, as a rule, simple. The chief point to remember is that most of us maintain the normal muscle-strength of the hand by means of countless fine movements constantly performed, rather than by any great or sustained effort. The chief element in restoring strength which has been lost is therefore constant repetition of all the finer movements of pure muscle training. As strength improves simple co-ordination work

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should be undertaken, and many of the ordinary kindergarten exercises will be found of value. Fastening buttons of various sizes, writing on a blackboard with chalks, tying knots and, later on, threading needles of different sizes, followed by actual needlework or knitting, will tend to do more to restore strength and co-ordination than we anticipate. When the actual apparatus is used it should be remembered that double arm work is of infinitely greater value than any amount of attention paid to the disabled member. Most right-handed people, for example, have the greatest difficulty in learning to swing an Indian club with their left hands unless they show it the way, as it were, with the right. This is, of course, true of all muscle training ; but it is particularly true when training the hand. As soon as possible not only double arm work, but general exercise for the whole body such as rowing, climbing, ladder-work, parallel bars and so forth, should be used. Even the use of a skipping rope ensures that the fingers are doing their part through a countless variety of movements on the part of elbow, forearm and wrist.

MacKenzie considers *the gluteus maximus and the ilio-psoas* to be solely the extensor and flexor of the hip, and that they serve as antagonists one to the other. From the point of view of muscle training it is well to accept this view and to ignore all controversy as to the rotatory action of either muscle. I have never been faced with the necessity of training either muscle when recovering from paralysis ; but it not infrequently happens that both suffer from disuse atrophy, in which event it is certain that the gluteus will have wasted more in proportion than its antagonist. This is particularly noticeable in patients who have used crutches for a considerable time, and the typical example is to be found in thigh amputation cases. The actual disability that results may not indeed be very great, but it leads to a lack of co-ordination in movement that can only end in a permanent limp unless muscle re-education is invoked to overcome the discrepancy. Standing, sitting (and particularly high-stride sitting) and lying trunk exercises should be chiefly relied upon. The chief point in training which helps more than anything else in strengthening the glutei is that the patient should be taught constantly to

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tighten up the muscles by attempting to draw the cheeks of the buttocks together at frequent intervals throughout the day, holding the contractions for increasing periods as strength is recovered.

*The rotators of the hip* rarely require special attention save in poliomyelitis cases ; though, in prolonged illness, the patient is liable to keep the joint rotated outwards for long periods and the internal rotators suffer from disuse more than the external. It is always advisable during convalescence, therefore, to instruct a patient with this condition to practise inversion of the hip assiduously as a bed exercise. Were this made a constant law, it is probable that there would be far less foot trouble after prolonged illness—due partly to standing with the whole limb everted.

*The adductors and abductors of the hip* also rarely require individual muscle training, though they frequently call for strengthening by exercises. The first step in muscle training, namely, teaching whichever happens to be the stronger to relax with gravity to aid it, can, in the case of the abductors, only be accomplished with the patient on his side by means, as a rule, of assistive abduction. Training, therefore, should begin with the patient recumbent, the weight of the whole limb being supported by a cord that passes to a support placed under the heel. The knee, of course, is in full extension. By moving the point of suspension beyond the middle line to the other side of the body we give assistance to adduction. By moving it away from the mid-line in the opposite direction we increase resistance to adduction. In this way the work done by the adductors can be varied from negative, past zero, to a very considerable positive amount. When standing, with the cord of the weight and pulley attached to the inner side of the foot, adduction can be assisted, but it is not necessary, as gravity is all-sufficient. So much so is this true that even if the cord is attached to the outer side of the foot adduction (from a position of abduction) is only an assistive exercise until a considerable weight has been attached. Exercises in the high-stride-sitting position are, of course, invaluable at a later stage. The rest position of the adductors is, of course, attained whenever the knees are in contact with one another.

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The patient should be instructed constantly through the day to brace his knees firmly together.

Flexion and extension of the knee are the property of the *hamstrings and the quadriceps*. If the training of the latter is considered in detail the reverse process will be that applicable to the hamstrings. The maximum assistance to the quadriceps from gravity (and therefore resistance to the hamstrings) is secured while the patient is prone, moving the leg from the vertical to full extension. Lying on the side (see Fig. 48, p. 92) we reach the dead point, and then we aim so to arrange the action of gravity that resistance is added by slow stages. This apparently difficult problem is open to the easiest possible solution. The patient, with head and shoulders supported, lies recumbent on a couch. First the heel, too, rests upon it, and the patient is taught to dorsi-flex his foot to the fullest extent and then to drive the back of the knee down on to the couch. When he can do this he shifts down towards the end of the couch so that the heel alone is unsupported by it. Again the knee is pressed down till in contact as before. By slow stages (usually about six) he shifts his position further and further towards the foot of the couch until, finally, its edge rests under and supports the back of the thigh, the leg, when all muscles are relaxed, hanging vertically downwards. When the flexion of the knee reaches an angle of about  $45^{\circ}$  the patient will find it easier to assume a sitting attitude in place of the lying or half-lying. The use of apparatus in training the quadriceps is very varied, as it may be used lying, sitting or standing. Enough, however, has been said already in the chapter on the use of apparatus (see Chapter IX) to indicate the main points. Detail must be worked out for each individual patient.

There are, however, two points which call for special emphasis. The first is that the one essential function of the quadriceps is to maintain the stability of the knee-joint in full extension. Lack of appreciation of this point may be a source of complete failure in the attempt to restore the use of the limb. The importance of restoring power to the lower and inner fibres of the *vastus internus* has already been indicated (see p. 182). What part is played by each individual

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member of the quadriceps group at each phase of movement from full flexion to full extension has, so far as I know, not been elucidated. If we watch the muscle action of a well-developed and uninjured limb, we cannot help noticing the wave-like contraction in co-ordinated sequence of the various muscle elements. It is not improbable that each element plays a predominant part only during certain definite set phases of the movement. This much at least is certain, that, if the power of full extension is incomplete, and if we ignore special training to rectify the incapacity, recovery is often indefinitely postponed. It is for this reason that I always teach that the most important phases in the ordinary heels-raising, knees-bending exercises are the beginning and the end, namely the bracing backwards of the knees when first rising on tiptoe and again before finally sinking to the rest position. The one thing to aim at securing, therefore, is the power of full extension. When this is done, and not before, training may be undertaken through an ever-increasing range. The test as to whether it is safe to increase the range is simply this. It is unwise to set or allow any exercise which the patient fails to complete by securing full extension. Increase in the range of flexion of a knee is useless unless full extension can be secured with ease from each degree of flexion that is secured.<sup>1</sup>

The second important point when training a quadriceps is that, while using apparatus, it is possible to set the weakened muscle an invaluable exercise by attaching the sound limb to the weight and pulley. The patient is then compelled not only to stand on the weakened limb but also to balance his weight upon it, and this balance work depends on stability of the knee and on perfect control of the muscles that regulate its movements. When the sound limb is hitched on to the apparatus the balance work performed by its fellow is unconscious—often a great asset in treatment. This is one of the examples of what is referred to in the preface as gaining our end “by stealth.”

<sup>1</sup> The study of a recent case has tended to confirm the opinion that each element in the quadriceps mass has a preponderating function at different stages of movement. In this instance the rectus femoris seemed to play its most prominent part in extending the knee-joint from full flexion to about 45° (or rather less) short of full extension.

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The rest position for the quadriceps is secured by keeping the leg in full extension ; that for the flexors by placing the knee in flexion at a right angle or less.

For the sake of brevity, training of the muscles supplied by the external popliteal nerve will be considered *in toto*, that of the muscles supplied by the internal popliteal being the exact reverse. Variation in individual cases will be required according to the relative strength of the muscles supplied by the anterior tibial and the musculo-cutaneous nerves respectively. Gravity assists the dorsi-flexors to the greatest possible extent when the patient is prone and the knee flexed to a right angle. In this position, therefore, the antagonists are taught to relax. The zero position is reached when the patient lies upon his side. If the patient lies with the injured leg next the couch, the tibialis anticus and posticus muscles can be trained against gravity ; if on the opposite side, then the evertors can be dealt with in similar manner (see Fig. 47, p. 92). Gravity resists the muscular action of the dorsi-flexors slightly when the patient is recumbent (or sitting) with the foot projecting slightly over the end of the couch. The resistance increases with increase in dependency of the limb, till it is greatest when the leg hangs vertically downwards. In this position gravity antagonises equally both evertors and invertors in movement away from the rest position, and can render assistance in return to it. The maximum assistance (or resistance) is afforded when the leg is placed upon one side, the foot projecting from above the ankle over the side or end of the couch.

The rest position for the dorsi-flexors is found in the sitting position when the feet are drawn well under the chair and the weight of the leg rests upon the toes (*cf.* Fig. 108, p. 269). The plantar-flexors are relaxed when the feet are moved forward till the weight rests solely on the heels. The invertors are relaxed and their antagonists maintained in a state of tension when the patient sits with feet crossed and the weight of the leg resting on the outer borders of the foot (*cf.* Fig. 110, p. 271), while the evertors are usually rested quite adequately when the sole of the foot rests quite flat upon the floor, the inclination of the tibia being slightly directed forwards.

The training of the muscles of the foot is similar to that used

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when dealing with a hand, the general plan of the muscle action being very similar. But if, as we have seen, the opponens pollicis is probably the most important individual muscle in the hand, so the adductor transversus must be awarded a high place when considering the foot. The actual foot-drill will be considered later (see Chapter XXXI.).

The question is often raised as to when muscle re-education should begin if a muscle has been completely paralysed. The answer is simple: it cannot be begun too soon once acute symptoms (if such are present at all) have subsided. It is common knowledge how rapidly skill in movement deteriorates in the absence of practice. Experience tends to show that complete inability to move a muscle rapidly leads the patient to forget what it feels like to move it, and this leads in turn to forgetfulness as to how to use it. Whenever paralysis is present there is a block somewhere which effectually prevents the passage of the volitional impulse past a certain point. Very soon disuse will tend to inhibit the passage of impulses even up to this point, and further ground is lost. In the absence of mobility the joint sense deteriorates and, in the absence of mobility and of the function of contraction and active relaxation, the muscle sense of the antagonists (as well as their function) is rapidly affected deleteriously. Thus, in quite a short space of time, all that remains in the part that is capable of function deteriorates, and the ultimate recovery is thereby prolonged. Our duty is to retain the whole part as nearly intact as may be, and not to let the undamaged tissues and senses suffer merely because some of their fellows have been disorganised.

Some argue that, if we tell a patient to attempt to contract a paralysed muscle before regeneration has taken place, we shall merely succeed in disheartening him. Of course we shall, if we do not explain how and why we expect his unproductive effort to help him. But given this knowledge, there is no fear of a disheartening element creeping in, and the fact that the part retains some evidence of vitality is far less discouraging than to allow it to be useless and often motionless month after month. Nothing can possibly more powerfully convey to the mind the impression of complete uselessness and disability,

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particularly as absence of movement promotes loss of power and decrease of mobility throughout the limb. The slow but steady decrease in bulk of the uninjured muscles, the steady loss of ordered sensation due to lack of movement, and the general decrease in vascular supply are all disheartening in the extreme. Well may these patients gain the idea that recovery is remote and well-nigh impossible. If on the other hand we maintain mobility, sensation and appearance unaltered save for the actual area involved, we are surely doing much to keep alive the hope of ultimate recovery.

In the treatment of all weak and paralysed muscles we must remember that patients are not made of muscle, just as after fracture we must remember that they are not made of bone. If we neglect to treat the other structures that have suffered or fail to maintain the condition of those that have escaped damage, we are not treating our patient to the best of our ability.

Then, too, without training a time will come when we shall be able to tell our patient that the path is again open for the passage of nerve impulses. Why should he believe it? He can see no change, he has forgotten from months of disuse how to send down his impulses. He fails to secure the expected movement, try how he may, largely because he does not know how to control the antagonists. Here, then, is a fertile source of functional paralysis being added to the organic. Lieut.-Col. A. F. Hurst, in a lecture to the members of the Incorporated Society of Trained Masseuses,<sup>1</sup> said that the unexpected early recoveries after nerve-suture occasionally reported are quite possibly the normal cases in reality, and that delay in recovery is often attributable to a "functional" element having been grafted on to the organic. That this does occur is undoubtedly true, and it is the fault of the treatment the patient has received and not of the patient. As Col. Hurst hints, a functional element can easily be rubbed into the mind during massage treatment.

In the treatment of all cases of weakened muscle or of paralysis the final restoration is not in our hands. It rests with the patient whether recovery is as complete or as rapid as the nature of his injury allows. Our part is to help him, to

<sup>1</sup> See the Society's Journal, June, 1919.

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show him what to do and how to do it ; to keep all that remains uninjured as intact as may be, and to make the earliest possible use of all opportunities. Having done this we have done our duty : but we have failed lamentably and sadly in its performance if we have failed to keep intact, to encourage, to re-educate if need be, or even occasionally to repress—the volitional element in our patient. He does not consist of an injured nerve or weakened muscle : he has a mind, and the success or failure of our treatment may depend entirely upon the effect it has on the mentality of the patient.

There is one great danger in muscle re-education, which must be fully appreciated. As voluntary movements only, and not individual muscles, are represented on the cortex, it follows that, if a command is sent from the cortex to the periphery to perform a certain movement, that action will be executed if in any way possible, even though the muscles that usually perform the movement are paralysed. Thus, unless due precaution is taken when training a patient who has a recovering ulnar nerve lesion, we may succeed only in teaching him to abduct his fingers in hyper-extension by his long extensors, and adduct them again in flexion by his long flexors. If there is no chance of recovery this may be a valuable "trick" to teach : it is the worst possible treatment if recovery is to take place. The same applies throughout the whole realm of muscle re-education. It is for this reason that the task of muscle training calls for great care and watchfulness on the part of the masseur, and also for a high degree of technical knowledge and proficiency. The mental strain involved by good muscle training is exacting to a degree, and not the least difficult part of the treatment is to secure the full co-operation of the patient in the form of volitional effort. Even this is not enough ; the effort must be purposeful and intelligent.

Prof. Wood-Jones, in his Arris and Gale lecture, concludes by giving a list of the more common forms of "trick" movements that can be developed by patients recovering from paralysis. If recovery is hopeless, by all means let us take advantage of them : while there is any chance of recovery, let us check their development with all the skill we may. The list given is as follows :—

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“(a) Complete division of the musculo-cutaneous nerve. The elbow is flexed by the supinator longus.

“(b) Complete division of the musculo-cutaneous and musculo-spiral. The elbow is flexed by the pronator radii teres.

“(c) Complete division of the musculo-spiral. The wrist may be extended by producing flexion of the metacarpophalangeal joints. The two terminal phalanges may be extended by the action of the interossei. The terminal joint of the thumb may be extended by “spring back” from the long extensor tendon, which acts as a ligament when the long flexor is brought into play.

“(d) Complete division of the ulnar. The fingers may be spread apart and brought together again by the action of the long extensors and flexors. The index finger may be adducted to the middle line by the extensor indicis proprius. The two terminal phalanges may be extended by the long extensors if the metacarpo-phalangeal joints remain slightly flexed.

“(e) Complete division of the median. Not uncommonly a fair fist may be made involving some flexion of all finger-joints by the pull of the flexor profundus innervated by the ulnar. This is one of the best examples of a cortical volition overcoming obstacles. The metacarpo-phalangeal joints may be flexed by the interossei. The proximal phalangeal joints may be flexed by the flexor profundus after the terminal joints are bent. The terminal joint of the thumb may often be bent, just as in musculo-spiral paralysis it may be extended, by using the paralysed tendon as a ligament. Opposition is often perfectly carried out by the action of the extensor ossis metacarpi pollicis and the ulnar-supplied adductors. The thumb can be “abducted” by the extensor ossis metacarpi pollicis.

“(f) Complete division of median and ulnar. The wrist may be flexed by the extensor ossis metacarpi pollicis. The fingers may be flexed by producing extension of the wrist.

“(g) Complete division of the internal popliteal. The foot may at times be depressed by the dissociated action of the peronei.”

To this list I would add the record of a patient under my

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care at the Special Military Surgical Hospital. He had complete and permanent paralysis of the deltoid. By flexing his elbow slightly and then extending it suddenly he was taught to swing his arm away from his side sufficiently far to allow the supraspinatus and clavicular part of his pectoralis major to complete, in perfect manner, the movement of abduction of the arm. This affords one of the rare examples in which the teaching of a muscle "trick" rendered great service to the patient.

## CHAPTER XX.

### RE-EDUCATION IN WALKING.

RE-EDUCATION in walking is a special art which calls for the exercise of great skill, but the reward is directly proportionate to the amount displayed.

Muscle re-education should begin before any joint can be moved, and while, if necessary, the limb is still encased in plaster. The patient is taught to contract and exercise each muscle or muscle group in turn in the manner already described for the treatment of splint or sling atrophy of the arm.

Too much importance cannot be attached to ensuring the return of co-ordination. After any lengthy period of inaction, from whatever cause, this power is impaired, and after injury the impairment is more marked. Every movement is the result of muscular contraction combined with relaxation of the antagonistic muscles. In walking, not only is this true, but the efficient working of one muscle is dependent on similar capacity in many others, some of them very remote. Even the placing of both hands in the trouser pockets has a marked effect on the general co-ordination of the body during locomotion. It is easy, therefore, to realise that marked weakness of one muscle, or of a group of muscles more intimately concerned with the movements of the lower limbs, will greatly militate against perfect co-ordination. Yet after injury of any sort there is a tendency for muscular wasting to follow, perhaps from disuse only, perhaps as a result of injury inflicted directly on the muscle, its nerve or vascular supply, or even on account of reflex action excited by injury to a joint whose movement is controlled by the muscle. Not only is the wasting significant of weakness, but a wasted muscle invariably requires a longer latent period to pass than does a normal muscle between the receipt of stimulus *via* its nerve and its subsequent response. This often holds good even if no obvious wasting can be detected. Thus it is impossible for a muscle which has been injured directly

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or indirectly to react normally to the impulses it receives, but the uninjured muscles concerned continue to do so. The inevitable result is loss of co-ordination.

Our first business, then, is to ensure the restoration of co-ordination in existing circumstances—or, in other words, to teach the muscles which have suffered least, or not at all, to adapt their contraction to suit that of their less fortunate fellows—and then to continue the process by educating the sound limb to adapt itself to any little vagaries of the injured limb.

The most simple movements should precede the more compli-



FIG. 104.—The final swinging exercise while sitting. Note the plantar-flexion of the ankle with flexion of the knee, and dorsi-flexion with extension of the knee.

cated, and so the first stage, whenever possible, should be to encourage the patient to swing the feet to and fro alternately over the side of the bed or couch. Often the first instinct of the patient is to swing them together, but this should be prohibited until the alternate swing has become quite natural, free from all rigidity and stiffness, until, in fact, a "loose swing" has been attained. Perfection cannot be attained until the movement is effortless: hence the necessity of starting with a swing through a range of minute amplitude. The range is very gradually increased. Then swinging together may be prescribed, followed by the performance of the two exercises alternately. These exercises must be continued till their performance is quite natural and free from all effort. If the instinct to swing the

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legs together is encouraged at the start instead of the alternate swing, "looseness" in movement is not so readily acquired, and the patient is liable to resent the persevering effort of the masseur to secure perfection in the alternate leg-swinging.

The swinging exercise may be advanced a stage by being performed with regular alterations in the rhythm. At the same time opportunity arises for increasing the strength of weakened muscle groups by calling upon them to contract to the full



FIG. 105.—Swinging the leg while standing. Note plantarflexion of the ankle and flexion of the knee. The patient is shown supporting himself by a chair placed in front of him for clearness in reproduction.

extent of their power. The best plan is for the patient to swing the feet alternately three or four times and then to hold the sound leg out straight while counting three slowly. The swinging is continued and the weakened leg is held in the same position for the same time. The length of time is gradually increased. The process is repeated, but now the cessation of movement takes place in the flexed position. Finally the movement is checked and contraction held with one knee bent and the other straight (see Fig. 104). The next stage is to educate

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ankles and toes to co-operate in the "swing." As each leg swings forwards in turn the ankle and toes are dorsi-flexed; as it swings back they plantar-flex. By the addition of slight hip movements the patient is now able to perform full "bicycling" movements in the air.

Two exercises can then be added. The patient stands on the sound leg between two chairs placed back to back and swings the injured leg to and fro. At first this will be done with a stiff knee and ankle, but gradually the muscles will be able to relax and the knee will bend as the thigh extends and the ankle will plantar-flex (see Fig. 105). On swinging forward, the knee will straighten and the ankle dorsi-flex (see Fig. 106). This is the natural movement of walking, and it may require close attention to see that it is efficiently carried out. It will be noticed that in this exercise alone a different combination of movement is required when treating a patient by relaxed or by active exercises (*cf.* p. 69). This is because the ankle movement in walking is the only natural movement that is performed in such a manner that the musculature is, as it were, at a disadvantage.



FIG. 106.—Second stage in swinging the knee. Note dorsi-flexion with extension of the knee.

Hence the natural "trick" of ankle movement in walking is very readily lost and supplanted by purely "natural" movement. After a few swings the patient sits down and places both feet flat on the floor with the knees extended to slightly more than a right angle. The toes of the sound foot are then raised from the floor and are lowered again while the heel rests on the ground (*cf.* Fig. 109). The foot of the injured limb follows suit. Flexion of the knee progresses until a point is reached when it

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is impossible to raise the toes, and then the heels are raised alternately while the toes rest on the floor (see Fig. 107). As the feet



FIG. 107.—Second stage of the first sitting exercise. The heel is raised and lowered.

are drawn further and further under the chair the movement becomes more limited till finally little or no movement can be



FIG. 108.—The final stage in the first sitting exercise. The heels cannot reach the ground.

obtained, but the toes and ankle can still be exercised together (see Fig. 108). Once more the knees are extended slightly till

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the soles of the feet rest easily on the ground. The two exercises are then combined, and the patient executes a species of "clog-dance" (see Fig. 109)—right toe, left toe, right heel, left heel, each tapping the ground in turn. The sense of hearing helps to maintain the rhythm. It will then be found that all the movements of ankle and toes which form a part of natural walking have been performed, though no weight has been placed upon the foot. The exercises can be made more severe from day to day by increasing the frequency of the movements, by the gradual alteration of the position of the feet, and by holding



FIG. 109.—The first two sitting exercises in the re-education of walking combined. The toes are raised and lowered, alternating with similar action of the heels. The result is the "species of clog-dance" referred to in the text.

them in the extremes of movement while counting. Between the exercises, unless contra-indicated (as, for instance, after a recent fracture of the internal malleolus), the patient is taught to rest with the legs crossed and the feet resting on their outer borders. He is then told to claw with the toes and to try to shape the foot as would do a monkey trying to climb up a pole. Having learnt to "claw" properly, he is told to maintain the position while counting (see Fig. 110).

As the rapidity of the exercises increases more and more weight is gradually placed upon the feet, but so far only a negligible amount has been so placed compared with the weight of the

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body, and the main object hitherto has been to accustom the limbs to move in unison, and to train the various muscle groups in the injured limb to co-operate with one another. Meanwhile it is possible to continue to build up the strength of the weakened muscle groups by perseverance with the original exercise of holding contraction, while counting without actual joint movement, and by paying special attention to holding the contraction during certain movements of those muscles which are weakened.

Exercises on the sliding-seat follow. They should begin with the foot-piece loose and the supporting bar at the lowest level. Day by day the bar is raised, and the elevation of the inclined plane is thus increased. When the exercise can be performed freely with the elevation at its maximum, considerable pressure is exerted on the foot. Probably the patient will do most of the work with the sound leg: this does not matter, as it will tire and the injured limb will then be called upon instinctively to play its part. Moreover, all the time hip, knee, and ankle are acting in unison. The masseur can often assist greatly by supporting the knee, or even by gentle kneading during the limits of movement if flexion is deficient. Extension can be aided by pressure on the knee while kneading the hamstrings. The great point is to see that the seat is driven back to the limit. For emphasis it is well to repeat that it is the power of maintenance of full extension which is, above all, required to maintain the stability of a knee-joint.

The bar is then lowered and the foot-piece is fixed in the position best adapted to secure the performance of the particular movement which happens to be most limited. The more nearly the foot-piece approaches the horizontal the more full does flexion of the knee become. The bar is raised gradually as the days pass.



FIG. 110.—To illustrate the "clawing" exercise while sitting.

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Assistance to all these movements can be given by various combinations with the weight and pulley. The lowest pulley can be utilised by holding the cords in the hands ; thus rowing is more nearly simulated. The rope over the top pulley can be



FIG. 111.—To illustrate an exercise for the adductors of the thigh. It is also either a relaxed or assistive exercise for the abductors according to the weight employed.

attached round the knee, but this device is not used very frequently. The patient can be taught to assist the movement by keeping the hands on the knees and pressing down, or under the knees and pulling up (*cf.* Figs. 50 and 51, p. 104). Otherwise the hands should grasp the seat or rails.

By this time more particular attention can be given to the

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strengthening of special groups of muscles by use of the weight and pulley. The most important exercise, and perhaps the most frequently overlooked, is that for the quadriceps, which is performed with the patient sitting, the cord passing under the chair and then under a stool placed in front of it on which rests



FIG. 112.—To illustrate the remainder of the exercise shown in Fig. 111.

the knee (see Figs. 52 and 53, pp. 105 and 106). The knee is alternately extended and flexed. All the other thigh muscles can be exercised most efficiently while standing on the sound leg. The hands should then, as a rule, rest on the backs of two chairs, between which the patient stands while facing or with his back to the apparatus (see Figs. 54 to 57, pp. 107 to 110), or

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with the hands resting on the back of a chair if standing "side-on" to the wall (see Figs. 111 and 112). As with all weight and pulley exercises, the severity must be gradually but steadily increased, either by adding to the number of movements or to the weight, or by holding the muscles in contraction while counting, or by increasing the range of movement. Assistive movement must precede resistive.



FIG. 113.—The third sitting exercise in the re-education of walking. Continuation of the "clawing" exercise. Note the body-weight is still partly supported by the arms.

The patient is now ready to begin to bear his body-weight, but he should be taught to do this gradually, otherwise he will lack confidence in the weakened limb.

The first stage in bearing weight upon the limb is the natural continuation of the "clawing" exercise which the patient has been performing seated on a chair. He places his hand on the seat, and then, with feet crossed and the outer borders in contact with the floor, he rises from the seat a few inches, supporting most of his weight on his hands (see Fig. 113). Day by day he rises higher and higher, and presently his hands leave the chair, with the result that the whole body-weight rests momentarily upon his feet. As he

rises higher and higher the length of time steadily increases, till finally he stands upright.

The chair is now placed in front of him, and he supports much of his weight on its back. Taking the remainder of the weight on the outer side of the sound foot, he uncrosses the other leg and stands on his feet, which now rest side by side on the floor, the weight still being borne on the outer border. The first "free standing" exercise is now performed by simple knee-bending through a few degrees only (see Fig. 114).

Soon the patient stands on his sound limb, swings the other

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FIG. 114.—To illustrate simple knee-bending. Note that the body-weight falls on the outer sides of the feet.



FIG. 115.—To show how the patient takes the first quarter of a full step. The left leg has been swung to and fro and is then checked in the position shown.



FIG. 116.—The second stage in taking a step. The patient then returns to the position shown in Fig. 115, and learns to "rock" to and fro.

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to and fro, and then, when the foot is falling from the front position, the heel is made to check the return by contact with the ground (see Fig. 115). With perseverance comes perfect co-ordination in the performance of this movement, and the power correctly to perform the first part of the natural walking step is restored.

The next stage is to perform this exercise once more, but now, as soon as the heel of the injured limb touches the floor,



FIG. 117.—Practising “rocking” on the walking board. The latter is a mere adaptation of a boom, and the trolley replaces a balancing pole.

the body-weight is thrown forwards, the toes of the injured limb fall to the floor, and the heel of the sound limb is raised (see Fig. 116). Return to the *status quo ante* completes the exercise.

As soon as the patient can “rock” to and fro in this manner he can perform about three-quarters of a single complete step, but so far the injured foot has been in front. Now he must practise the “rocking” with the sound foot in front and that of the injured limb behind. The next advance is to withdraw

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the moral support of the chair-back, first by taking one hand off, then the other, and finally by moving the chair to a point where the patient is not able to touch it, but where he could do so without any difficulty whatever if emergency arose.

A step and a half is now undertaken up to the chair, and then



FIG. 118.—To show the first position for ordinary tip-toe exercises.



FIG. 119.—The second position in tip-toe exercises. The weight of the body has been rolled across the transverse metatarsal arch.

the return is made. This constitutes a more advanced form of "rocking."

Great care should be taken to ensure that in all walking exercises the feet are kept straight and that thereby the weight is thrown on the outer borders of the feet. It is also essential at this stage that the patient should be instructed to confine his efforts to the true "heel and toe" walking only. A line may be drawn on the floor on which the patient must place his feet, or, better still, two lines are drawn, and in the space between them the patient walks. At the special surgical hospital

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at Shepherd's Bush the author has arranged a modification of balancing on a boom. A strip of thick wood is placed on the floor (broad at one end to give the patient confidence, narrow at the other) on which the patient performs the exercises. The place of the chair is taken by a trolley support (see Fig. 117).

All the ordinary leg and foot exercises may now be undertaken, but a word is necessary as to their performance.

The patient stands with the weight of the body on the outer borders of his feet; the inner borders need not be completely raised, but should bear little weight. The heels and toes are kept parallel and the feet about four inches apart. The knees are kept rigidly in full extension. The body-weight is then thrown on to the heels and is gradually transferred forwards till most of the weight is on the head of the fifth metatarsal (see Fig. 118). A close watch must be kept at this point to avoid a most deleterious action. It is essential that the plantar concavity of the anterior metatarsal arch should be maintained. Otherwise the weight is liable to be taken on the heads of the fourth and fifth metatarsals, and this will lead to a "splaying" of

FIG. 120.—To show the raising of the inner side of the feet while the toes perform the "clawing" exercise.

the foot in this position—one of the causes, when permanent, of the pain of metatarsalgia. A kind of circling movement is now performed which throws the weight more and more towards the inner side of the transverse metatarsal arch, the heels meanwhile being raised slightly (see Fig. 119). The toes are then turned inwards and the heels out, and the exercise is repeated. The third stage is to reverse the position (heels together, toes out) and repeat. If there is any tendency to flat-foot, this



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exercise should be omitted until muscular strength is sufficiently restored to ensure that there shall be no strain on the plantar ligaments. The same applies to the exercise illustrated in Fig. 114, p. 275.

Raising and lowering the inner sides of the feet, which are placed parallel to one another again (see Fig. 120), "clawing" meanwhile, forms the fourth part of the exercise, while the fifth consists of standing on the heels and raising the toes (see Fig. 121). The sixth and last is the ordinary heel-raising-knee-bending exercise, but this should be performed in at least two positions, one with the feet parallel and the knees touching (see Fig. 122), the other with the toes apart and heels together (see Fig. 123). No matter how far the toes may be everted, care should be taken to ensure that the limb bends so as to maintain the long axis of the thigh parallel with that of the foot. Another point to remember is that patients are usually allowed to perform this movement far too rapidly. The heels should be raised to their full extent and the knees driven firmly backwards before any bending is commenced. The bending should be performed very slowly and very gradually, and the patient should "squat" on the heels while he counts "three" very slowly before returning to the original position on tip-toe with the knees taut.

These six (or seven) several exercises should be regarded as various parts of a single exercise. In the massage-room they should be performed once; a few minutes' massage follows, and then they are performed again. As soon as the patient can be



FIG. 121.—To illustrate the exercise in which the patient stands on the heels. Note that the inner borders of the feet are raised more than the outer.

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relied upon to perform the exercise efficiently, he is instructed to do so twice or three times a day. Thus on getting out of bed in the morning he does it once, a second time after shaving, a third after his bath, and so on up to eight or ten times. The "spacing" of the exercise is most important.

Skipping is invaluable as a *finale* in treatment, while tip-toe walking, "goose-step," and heel walking all have their place.

Bicycling on a stationary bicycle can frequently be started at an early date. Not only may the pedals be driven round and round, but they may also be rocked to and fro with advantage.



FIG. 122.—The first heel-raising-knee-bending exercise. Note the knees fall directly over the toes. The feet are kept parallel.

The aim is not so much to regain strength as to re-educate co-ordination. If we wish materially to build up the strength of our muscles by the use of a bicycle, we go for a ten to fifteen mile ride. Few patients would be able to spend two hours or more on a stationary bicycle. The monotony alone is too fatiguing. By tightening the resistance it is supposed to be possible to do a great amount of work in a short time. Few of us, I think, would be foolish enough to elect to ride in the teeth of a contrary wind or to tackle an adverse hill in the early stages of training in the open. It is common knowledge that these things act detrimentally owing to fatigue. Why then attempt them in the course of re-education?

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“Kneeling-trunk-falling” is often of great service (see Fig. 124). As pointed out in a previous chapter (see p. 182), it is essential to regard and strengthen the lower fibres of the vastus internus in nearly all cases of leg injury.

Before the patient is discharged, an attempt must be made to impress the necessity of walking with heels and toes parallel, of standing with the toes slightly turned in while the knees are kept well braced back, and of avoiding the “toes-out-knee-bend” position, which is so easily acquired and so hard to discontinue. It is often wise to build up the heel of the boot or shoe on the inner side by one third to half an inch. This ensures the maintenance of the correct position of the feet, but the patient must be impressed with the vital importance of conscientiously performing the true “heel-and-toe” movement, and of stiffening the knee from the moment the heel touches the floor until it leaves it again. If more attention were devoted to training the quadriceps when treating cases of flat feet, this distressing condition would be found to be far more amenable to treatment.

Thus is performed the re-education in walking. Once allow a patient to limp for any length of time, and he may acquire a life-long habit, which may, in turn, lead to grave disability out of all proportion to the original injury.

Modifications are required to suit each individual case, but the general principles should always be observed.

In this as in all remedial exercises the most important point to observe, if success is to be ensured, is so to arrange the exercises that progress may be made day by day, and that each addition is so slight that the patient’s muscles



FIG. 123.—The second heel-raising-knee-bending exercise. Note the knees still fall directly over the toes. The feet are at about an angle of  $90^{\circ}$  to one another.

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are unable to recognise any increase in the strain put upon them.

It will be noticed, in the description of the re-education, that every care is taken to ensure against any dropping of the longitudinal arch of the foot ; but, if this has taken place and the patient is flat-footed, all the joints in the foot must be loosened thoroughly by manipulation, and then the re-education exercises



FIG. 124.—The end position of kneeling-trunk-falling and raising.

will provide a perfect scheme for the restoration of the disability, though those described for the treatment of metatarsalgia may be added with advantage. (See Chapter XXXI.) If actual deformity is present, exercises can sometimes relieve the patient to a certain extent ; but to secure perfect restoration it is often necessary to place the limb in plaster after a thorough wrenching of all the joints of the foot. As a preliminary, if the case is acute, and the foot swollen, blue, and cold, general massage to

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benefit the circulation should be given for a few days while the patient is kept in bed. In addition, free "bed gymnastics" should be prescribed if the patient is to receive full benefit from treatment. All the muscles should be exercised regularly, but without placing the foot on the floor. When the plaster has been removed the patient must be warned forthwith that under no circumstances is he to stand on the floor without wearing shoes with heels raised on the inner side, as already described, or to allow his weight to fall on the inner side of his foot during



FIG. 125.—To show one method of attempting to stretch the tendo Achillis.

the exercises. It is well to remind the patient that even when taking a bath he must stand in such a position that the longitudinal arch is maintained. His trouble has been due to the stretching of the structures in the sole. The moulding of the foot has relaxed them, but has not shortened them again; it has only made shortening possible. This takes time, and, if they are stretched again once only, the good acquired by weeks of patient work can be undone in five minutes.

The "clawing" with feet crossed is also designed to arrest the dropping of the anterior metatarsal arch and subsequent meta-

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tarsalgia. Should this develop it is important to secure relief at once by strapping the arch, pending the restoration of the foot by the exercises. Assistance can also be afforded by inserting pads behind the heads of the metatarsals or by placing a bar of leather, half an inch deep—as on a football boot—under the sole. This bar is commonly placed much too far forward. The first metatarsal head usually rests in a shoe at a point just in front of the place where the sole is made first to touch the ground. The bar, therefore, as a rule, should be so arranged that the weight is borne on a part of the sole which, in ordinary life, does not touch the ground at all. It should be unnecessary to add that the bar should be applied obliquely across the sole, as the outer end must rest entirely behind the head of the fifth metatarsal. At first it is a matter for surprise how far back in a boot this point really lies.

This device is often of service in the treatment of claw-foot. The disability commonly arises from insufficiency of the tendo Achillis. The bar, by dorsi-flexing the foot in walking, naturally entails the stretching of the tendon, and every exercise should be devised to assist the process. Massage for this condition sometimes helps to an appreciable extent. The patient should sit facing the masseur, who stands with one foot forward and knee bent. The patient places his foot flat on the inclined plane formed by the masseur's thigh (see Fig. 125). The inclination is gradually reduced while deep lateral manipulation of the calf is performed. The tendon itself may be vibrated. All the extensors of the toes require stretching, and here again the vibrator is very useful. It is essential that all the joints in the foot should be loosened as thoroughly as possible, especially the tarso-metatarsal joints.

The treatment of foot deformities and of metatarsalgia will be considered later (see Chapter XXXI.).

## CHAPTER XXI.

### MASSAGE TREATMENT IN NEURASTHENIA.

IT has been said that only those who have been victims of neurasthenia are competent to treat it. However valuable may be the experience, it cannot be regarded as essential, though only those who are capable of appreciating the sufferings of their patients should undertake their treatment. To some minds the illness seems to be quite incomprehensible, and so it comes about that not all masseurs are temperamentally fit to deal with this class of case. For their own credit, no less than for the sake of their patients, they would be well advised to recognise their incapacity and refuse to undertake the work.

For treatment to be effective there must be a clear understanding of the condition that exists, how it has developed, and what progress should be expected.

There is a tendency, not only among the laity, but even among medical men, to despise the neurasthenic. The idea seems to be deep-rooted that, because a patient fails to produce physical signs to account for the symptoms, therefore the whole illness is imaginary. Those who hold this view would be not a little incredulous if they were told that they had suffered from neurasthenic symptoms themselves, yet so it is. We are all neurasthenics at times, though for most of us the attack is transient, thanks to the provision of recuperative power by a merciful Providence. The most unlikely subject for an attack may go for a long day's tramp, shoot, or golf. He comes home, has a hot bath and a good dinner, and then sits down in front of the fire to read. He feels in his pocket for a pipe and finds it is upstairs. A wave of irritation passes over him totally out of proportion to the cause, and he experiences for a brief moment one of the symptoms of neurasthenia. This victim goes to bed, has a good night's sleep, and the attack is over; but let him pass a restless night, and his irritability next day will be

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very marked. Repetition of a few more strenuous days without adequate rest, and appetite will fail, trifles will begin to worry, and many of the symptoms of a neurasthenic attack will be well established.

Most of us know the "good-for-nothing" feeling that follows an attack of influenza, tonsilitis, or other infective illness, and have experienced the irritability that accompanies it. Any trifle is liable to annoy, everything fatigues. If recuperative power is good, these symptoms soon vanish. But imagine the poison to have bitten a little deeper, magnify this irritability and fatigue, and we can appreciate that the neurasthenic symptoms might be very serious. If people would only realise the necessity of allowing adequate time to pass in order to ensure complete recovery after an attack of influenza before resuming work, there would be less neurasthenia.

The psychical state produced by anxiety or trouble can supply symptoms which exactly correspond to those that follow sepsis, and are more or less familiar to most of us. Magnify the experience common to us all, and we see the picture of neurasthenia.

Neurasthenia is not an illness of imagination, and, if we want to discover the cause of the illness, we must take into consideration the whole of the patient's circumstances, his whole life, which Herbert Spencer described as consisting of "the definite combination of heterogeneous circumstances, both simultaneous and successive, in direct combination with external co-existences and sequences." If we take the trouble to do this, a careful study has shown that, far from despising the neurasthenic, we are often compelled to admire the pluck and determination that has postponed the final crash for, it may be, years. In the first place, then, if we wish to treat neurasthenics at all, let us extend to them sympathy begotten of a full understanding of the cause of their attack; and our respect when, as is so often the case, they have merited it by the fight they have put up against their symptoms. There must of course be no maudlin sentimentality in our attitude to our patients, which must be moulded only by appreciation of their past and present state.

Most writers on neurasthenia are agreed that the diagnosis

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cannot be justified unless there is fatigue. This may be due to physical or psychical exhaustion, or to any cause that saps vitality, the chief being chronic sepsis or some acute general infection. Fatigue of the nervous system simply amounts to this, that the nervous energy remaining is inadequate for all the needs of the mind and body. The highest centres, being the last to develop, and therefore being the most intricate, suffer first ; and so the mentality of the patient "gives out" and the perspective of life is lost. To quote from Lewis Carroll, the neurasthenic tends "to look at all things with a sort of mental squint."

As the illness advances, the "lowering of the amount of the nervous potential that is available for the use of the organism," as Maurice Wright expresses it, leads to "deficiency in the innervation of the bodily functions," and we find that such troubles as indigestion and constipation develop. The stomach is not diseased. The deficient innervation has led to loss of muscular tone, the stomach fails to empty itself as it should, and the patient suffers from flatulent dyspepsia, often apparently accompanied by hyperacidity. The patients at any rate very commonly dose themselves freely with bi-carbonate of soda, and most claim that they have benefited from it. Whether this is due to "faith" or to the actual action of the alkali I do not know. The muscles of the lower bowel also lose their tone, simply from lack of adequate nerve control. Then we see the possibility of two of the vicious circles of neurasthenia. The nerve fatigue interferes with digestion, absorption is deficient, nutrition fails, and the nervous system fails further in consequence. So, too, the nerve fatigue interferes with normal defæcation, septic absorption takes place, and the poison further lowers the vitality of the nervous system. The onset of insomnia adds another very serious item, which can take its place as a potent factor in any of the numerous vicious circles it is possible to describe.

When the attack is established there are three main features —fatigue, depression, and irritability.

The fatigue of the neurasthenic is genuine ; there is a real muscular asthenia due to deficient innervation. It is true that the neurasthenic can, in a moment of emergency, exhibit

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considerable powers of endurance ; but so can a patient who is failing in the later stages of diabetes, consumption, or other chronic conditions. But whereas in the latter instances the effort may hasten the end, in the neurasthenic it only tends to increase the severity of the symptoms. Thus the common advice of " pull yourself together " is really the worst that can be offered, and many victims owe their downfall to the mistaken sense of duty which has impelled them to " pull themselves together " instead of " giving in " while the condition was not yet serious. The fact that the muscular asthenia is present tempts us to strengthen the muscles by the prescription of exercises. There could be no greater error in treatment. The muscles themselves are healthy, it is their innervation that is at fault. The expenditure of nervous energy in the performance of exercises will inevitably push the patient further down the hill. When the nervous system is rested and its tone restored, muscular strength will return, and the general toning up of the muscles may be completed by exercises or, preferably, by the use of the Bergonié chair, which entails no risk of tiring a nervous system that has only recently recovered its stability.

It has been stated that the depression of the neurasthenic " is the reflection in consciousness of the plaint of the cellular aggregate, suffering from the deficiency of vegetative life." This supposes each cell of the body to be endowed with the mental attribute of a complete and separate entity—that each cell, conscious of weariness and the depression which accompanies it unless counteracted by some all-satisfying attainment, sends up, as it were, its plaint of weariness to the brain. There, under this theory, is received an overwhelming avalanche of ceaseless complaining from millions of cells. Small wonder, then, that there is depression and that life is surveyed with " a sort of mental squint." The depression is often reflected in the facial expression ; so much so, indeed, that Charcot recognises it as the *casque neurasthénique*.

The irritability is also similarly explained. It is incredible that the mind should not suffer thus, and, unless exhaustion is too great, it is necessary that physical irritability should be its outward sign.

It is easy to understand that the combination of fatigue and

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depression should lead to fantastic ideas to account for the sensations experienced ; and, when we add thereto the constant liability to perverted somatic stimuli, nothing should surprise us in the way of phantasms, phobias, doubts, or misgivings. These patients are not mad ; they are merely victims of their sensations. When vaso-vagal storms are added, the sufferers' condition is parlous indeed, and well may they adopt what we may call the neurasthenic's creed : " This too is vanity and vexation of spirit. Vanity of vanities : all is vanity ! "

If this is the picture of the neurasthenic, how can we compass alleviation of the symptoms ? The first obvious thing to do is to enforce rest. Bed, and bed alone, may suffice. But bed alone may only serve to aggravate the mental symptoms, whereas sometimes peace and comfort can be attained without insisting upon absolute rest in bed. It is often a most unwise move, and particularly if we are dealing with severe insomnia, to dump a patient straight into a nursing-home. Not infrequently this unexpected course acts most deleteriously. If " home conditions " are possible it is often well to make a start, at least, without change. It is, however, essential to insist upon the minimum expenditure of physical energy.

The faulty innervation of the stomach, and the consequent inability of the organ properly to empty itself, renders digestion difficult and there is loss of appetite. Hence all these patients require to be " fed-up." But many have been under-fed for weeks, or it may be months, and over-feeding may do much more harm than good in the early stages of treatment. Encouragement will succeed : force will fail. So, too, the nurse who reports, " The patient made a poor breakfast but really seemed to do her best, and I am sure she will do better in a few days," will succeed ; but failure will be the reward of the report " I could not get the wretched creature to make the smallest attempt to eat anything, although I badgered away for half an hour."

The patient invariably is endowed with the disconcerting idea that " no one ever had such an illness as this," and is therefore convinced that no one understands the condition. Hence follows distrust of doctor and nurse alike. Only too often previous experience of both has justified the opinion. So our next duty is to win the patient's confidence, and, to do this, conver-

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sation must be encouraged. As the "tale of woe" is unfolded in a "pitiful minor key" it is possible to point out how natural has been the sequence of events and how simple in reality is the explanation of the symptoms. There are three golden rules:—never to lie to a patient, never to forget what the patient has said or what has been said to the patient, and never to promise the impossible. Let us also remember that the average neurasthenic is no fool, but is usually a most highly intellectual individual for the state of life to which he or she has been called.

The illness is characterised by wave-like variations, and it is well to forewarn the patient of the fact. Peace and happiness will return in the evenings before they do so in the morning; good days will become more and more frequent, bad days fewer and further between. The disappointment of a "bad day" after a few "good days" may throw a patient right back unless warning of the inevitable "wave" has been given. The barometer has a potent bearing upon "waves."

An acute case of short duration dating from a serious crisis (such as an operation or accident), which is now over, will get well quickly; a chronic case of long standing, with, it may be, the main cause (such as trouble in family life) still operative, will recover very slowly.

It is usually possible to convince a patient of complete understanding of the condition, and to promise some alleviation. Then the moment any trace of improvement has been admitted we must play it for all it is worth; for, as a rule, the true neurasthenic welcomes any vestige of improvement, which the hysterical patient would equally resent.

So far we have considered what almost amounts to the psychical aspect of treatment. Without it purely physical treatment will rarely succeed, though the converse holds equally good, that psychical treatment without the physical is usually a failure also. In psychasthenia physical treatment is, of course, useless: in hysteria, physical treatment which falls short of physical punishment will only tend to confirm the hysterical phenomena.

In treatment it is a fatal mistake to confuse hysteria and neurasthenia. For a hysterical patient by all means let the physical treatment approach as near punishment as may be in

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safety. A really heavy pummelling at the hands of an expert masseur may be beneficent, and the patients should get all they can stand, short of precipitating an outbreak. "Let us have no nonsense about it ; I have got to give you a thorough good dose and you have got to lump it" may suffice to cure an attack of hysteria, though the writer prefers psychical treatment to physical for these patients.

In the treatment of neurasthenia these tactics are fatal. The illness is due to fatigue : the massage must soothe and rest, it must not add to the fatigue. No neurasthenic should ever *require* to rest after massage owing to fatigue or exhaustion ; the desire for rest should be based on the wish for freedom to enjoy to the uttermost the luxurious sense of ease, comfort, and peace that follows the visit of the masseur. The visit and the subsequent hour or more should be the brightest spot in the patient's day. If we wish to attain this end the first law in treatment must be :—

Only the most gentle movements possible are to be performed ; any irritating (so-called stimulating) movements are to be prohibited.<sup>1</sup>

A necessary corollary may be called the second law of treatment :—

Any point that is tender or hypersensitive is the last that should receive attention.

Many cases have been brought under the author's notice in which treatment has failed owing to neglect of this law. Most neurasthenics have some area of the body on which it is impossible to perform any massage movement without producing a sensation of irritation. A single touch on this area may undo the good of half an hour's previous work. A patient who develops neurasthenic symptoms after an abdominal operation serves as an example. The symptoms will probably be attributed by the patient to pain in the scar. There may be pain of course, but its measure is central, not peripheral. Abdominal massage is ordered ; it may well suffice to render the patient's

<sup>1</sup> This and the following two laws of treatment are quoted from a paper by the author read before the Medical Society of London, and published in the *Practitioner*, January, 1914. Much of this paper is here epitomised ; the paragraphs placed in quotation marks are quoted *in extenso*.

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condition far worse. Massage treatment should begin on the back, and, if necessary, the legs, arms, and head may be treated. Not until the patient can submit in perfect tranquillity should the abdomen be touched, and even then the site of operation must be avoided till the last. One of the signs of progress is the gradual approach to the area of chief discomfort. It is a progress the patient can note, and the "I could not have let you touch me there a week ago" is a sure sign of future success.

Details as to the exact nature of the movements which should be employed cannot be given, as of necessity they vary with each case.

The third great law of treatment is :—

The actual nature of the massage movement performed is of minor importance provided it is rhythmical.<sup>1</sup>

" ' I shall never forget the marvel of the rhythm,' was the farewell remark of one of my patients, and I would submit that herein lies the whole secret of success in the treatment of neurasthenic patients by massage.

" An American physician . . . wrote to me recently to say, that if a patient complained of any obscure pain, his one test as to whether or no it was due to organic trouble rested on the result of massage such as I advocate. ' If,' says he, ' the pain persists in spite of massage, some organic lesion must be present.' I do not venture as far as this, but there is much truth in the statement. If we remember a fact, the truth of which I have proved in many hundreds of cases, viz., that the pain even of fracture can be relieved by massage, then the claim to give relief if no organic lesion is present seems less ambitious.

" The massage I advocate consists solely of a rhythmical stroking of the surface of the skin, and the lighter the stroke the more effective the massage. ' Light as a caress' . . . is the description given by the great author of this method of treatment. He invented the treatment for cases of fracture only, and has left it to his disciples to develop his method for the treatment of other complaints. I am proud to recall that he referred to me as his ' English disciple,' and deputed to me

<sup>1</sup> Stroking is the only movement in which perfection of rhythm can be attained.

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the task of preaching his gospel of healing in this country. He knew my views intimately, and I had hoped to submit this paper to him for approval, and to claim his endorsement of the statement that the rhythmical nature of the movements is not less important than their gentleness. The death of Lucas-Championnière has dissipated that hope, so I can only give you the assurance that, under happier circumstances, his approval would not have been withheld.

“ So far I have spoken with the confidence I red of experience. When the question is raised as to the manner in which the massage or stroking can possibly act, we pass at once to the realm of speculation, that is, of uncertainty. One thing, nevertheless, I can assert without fear: that there is in it no element of mesmerism or any other more or less occult science. For my own part, I believe that the action of the massage is purely physical, and that the following explanation approaches to the truth. If we consider two of the impressions that reach the brain, vision and hearing, we find that the chief thing they possess in common is that they are transmitted thereto by rhythmical waves; and we know that, in the case of hearing, certain variations in the rhythm are apprehended and recognised by the brain. Such is the nature of our perception of music. It is probable that all other sensations are due to the arrival in the brain of rhythmical impulses by way of the various sensory nerves. In the same way, we know that, in all probability, the contraction of muscles during life is due to the sending out by the nerve-cells of rhythmical impulses along the nerves. An amplification of this is found in the proverb that habit is second nature, which means that by practice and repetition human life, its functions and actions, are subdued to a natural rhythm.

“ Now, my interpretation of neurasthenia is that the rhythm of life is disturbed, and that the nerve-cells, which normally send out certain impulses in a rhythmical manner, lose their control when afflicted by this disease, and rhythm vanishes. The result is that, in response to a stimulus, there occurs a sort of explosion of nervous energy which continues until the cells are more or less exhausted according to the severity of the illness. Take, for example, a case of insomnia. The patient gets into

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bed 'dog-tired,' but the act of lying down or possibly of touching the bed-clothes constitutes a stimulus and causes an explosion of nervous energy which effectively prevents the patient from sleeping. Only when the explosion is more or less exhaustively complete, will the patient snatch a little fitful sleep.

"My attention was drawn to this point in a recent case in which the neurasthenia took the form of violent vaso-vagal attacks resembling angina. I think I may say that the explosions of nervous energy, on the part of some of the nerve-cells connected with the heart, completely puzzled the three highly competent observers whom I was able to consult. I have yet to see the case of neurasthenia that could not thus in some degree be accounted for: certainly this explanation of the symptoms is frequently tenable, if massage treatment is to be the main curative agent.

"If this is the nature of neurasthenia, then its cure is to be found in restoring to the nervous system the lost rhythm. I believe this may be done by sending up to the diseased cells rhythmical impulses, by means of massage of the variety I have described. Rest alone, mental and physical, will sometimes effect a cure by reducing the inimical stimuli in quantity and quality; and so potent is this remedy in suitable cases, that it can even counteract the injurious effects of the heavier forms of massage. But if, rest by itself failing to secure recovery, some curative agent is required, then our one hope rests in the massage treatment for the trial of which I plead.

"My theory is all speculation, but it covers clinical facts. However, I am no authority on the voluminous literature on the subject of neurasthenia, and some such theory may, for aught I know, have been propounded before. All I would suggest is that, should anyone be called upon to deal with an intractable case of neurasthenia of whatever nature, he should bear the three points to which I have drawn attention in mind when devising his treatment. I do not think he will regret having done so, nor will his patient."

It is possible to give a few general hints as to technique, but nothing more. Every care must be taken to render the conditions for treatment ideal. A part must be chosen for the start

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where no pain or discomfort has ever been felt, and then the hand should make two or three movements first upwards and then downwards. The expert will be able to tell at once which will prove most beneficial ; failing experience, the patient must



FIG. 126.—Stroking the back. The left hand is finishing one stroke while the right is preparing to begin. This is a very difficult movement, and requires great skill to attain perfection of rhythm.

be asked to state which movement is preferable. As mentioned in Chapter IV., surface stroking seems to be the most difficult of all manipulations to learn. Temerity, perhaps, plays a large part in ruining technique, and "trying hard" to do the right thing is also sure to wreck it. Natural movement, com-

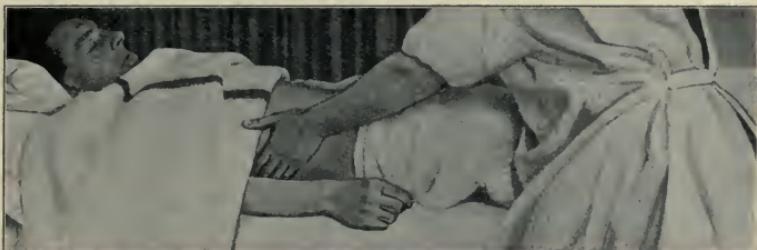


FIG. 127.—Stroking the abdomen with both hands. The beginning of the stroke.

bined with a degree of firmness, which should slowly decrease as the masseur becomes more expert, is what the beginner should cultivate. (See also p. 31.)

No stimulating movement is to be given, so exposure must be reduced to the minimum, especially when dealing with the legs. One hand can support the bed-clothes while the other

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does the massage. In this way no part of the limb need be exposed during the treatment. It is well to have a hot-water bottle at hand, as cold feet and sleep are incompatible.

If the patient can remain prone for a sufficient length of time,



FIG. 128.—Stroking the abdomen with both hands. The end of the stroke. It is a very difficult movement to perform rhythmically, and requires much practice. The use of one hand at a time is much more simple.

it is well to perform the massage of the legs on their posterior surfaces. A pillow must be placed under the ankles so that the feet may rest comfortably (*cf.* position shown in Fig. 14, p. 49).

Five or six minutes' stroking from buttock to heel, or *vice*



FIG. 129.—Deep stroking of the colon : nearing the end of the stroke. Note the position of the pillows.

*versâ*, should suffice, the rate being some ten or twelve movements to the minute. Each several movement should be an exact replica of those which precede and follow it. There must be no variation or deviation.

The back massage must be performed in a line which is exactly parallel to the spine. It should start over the high

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dorsal region and descend to the sacral area, or the reverse. It is rarely wise to use both hands together, one on either side of the spine, as it is almost impossible to maintain the rhythm. It is much wiser to work for, say, three minutes on one side, then



FIG. 130.—Deep stroking over the dilated stomach.

three minutes on the other. The rate of stroke is about the same as that on the leg. The central area over the spine itself then receives attention for about five minutes. The first three are spent in duplicating the movements already performed at



FIG. 131.—Stroking the neck: patient sitting. The beginning of the stroke.

the sides, or the number of strokes may be increased—the rapidity of passage of the hand must remain unchanged—by the use of the two hands alternately (see Fig. 126). During the last two minutes the hand, or hands, should begin the movement a little lower down the spine (or should cease the move-

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ment if working upwards), and the area treated should become smaller and smaller till only the lower lumbar area is treated.



FIG. 132.—Stroking the neck: patient sitting. The middle of the stroke.

The touch becomes lighter and lighter till finally the patient should be barely conscious of its cessation. Success has been attained if the patient remains motionless for a few moments



FIG. 133.—Stroking the neck: patient sitting. The end of the stroke. The back of the patient's head should rest on a pillow or towel, which, in turn, rests against the masseur's waistcoat.

after treatment has ceased and draws a deep breath before moving.

The arms are treated in a similar manner. They must rest on the bed supported throughout their whole length. The

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number of strokes per minute will be increased, as they are shorter. The rapidity remains unaltered.

The abdomen also is treated in the same way, the stroke fol-



FIG. 134.—Forehead stroking : patient sitting. Commencement of the movement.

lowing the line of the lower six intercostal nerves from the mid-axillary line to the centre of the body (see Figs. 127 and 128). If constipation is present, deep stroking with one hand up the



FIG. 135.—Forehead stroking : patient sitting. The ulnar borders of the fingers crossing the eyes.

ascending colon and down the descending with the other may be performed (see Fig. 129). It must be slow and rhythmical and vibrations should not be added. Nothing must be allowed to disturb the general rhythm of the whole *séance*. A dilated

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stomach may be treated by transforming the superficial stroking of the right side into deep stroking over the upper part of the



FIG. 136.—Forehead stroking : patient sitting. The end of the movement. The patient's head should be supported on a pillow or towel which rests against the masseur's waistcoat.



FIG. 137.—Second movement for forehead stroking : patient sitting. The right hand is commencing the movement ; the left is just finishing.

abdomen ; the hands may work alternately (see Fig. 130). If any deep stroking is to be performed the knees must rest on a pillow to flex the thighs and so relax the abdominal wall.

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Some patients greatly value head massage and respond to it very readily. This particularly applies to insomnia patients.



FIG. 138.—Head stroking: patient recumbent. Note position of masseur and patient. The movement begins with the passing of the hand over the pillow. This can be made to produce a slight swishing sound, which, being rhythmically repeated, acts as an additional suggestion *via* the sense of hearing.

The treatment may be given sitting up or lying down. In either case the stroking should extend from the level of the hair to the point where the treatment of the back ceased, and should



FIG. 139.—Head stroking: patient recumbent. The hand pivots round the ball of the thumb which rests over the eye.

resemble it in all respects, except that it is quite easy to use the two hands together when the patient is sitting down.

Treatment of the front of the neck is performed with the

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two hands, if the patient is sitting, the stroke starting just below the chin and extending right out on to the shoulders (see Figs. 131, 132, and 133). The head rests against the masseur's



FIG. 140.—Head stroking : patient recumbent. The hand has supinated to reach the angle of the jaw.

waistcoat supported by a thin pillow or folded towel. The rapidity of movement must be rather slower than on the trunk ; and, in spite of the shorter "sweep," only ten or twelve move-



FIG. 141.—Head stroking : patient recumbent. The hand pronates to embrace the side of the neck and then sweeps down to the shoulder, and thence on to the sheet, thus producing at the end of the stroke a slight "swish" exactly comparable with that heard during the earliest part of the movement.

ments a minute should be performed. Three or four minutes should suffice.

The forehead may then be treated for a similar, or perhaps rather shorter, length of time by each or either of two move-

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ments. The first starts from the middle line (see Fig. 134); the ulnar borders of each finger in turn pass over the eyes with the lightest possible touch (see Fig. 135), and the movement ends over the temples (see Fig. 136). The second consists of plain upward stroking from the level of the eyebrows, passing over the top of the head throughout its anterior half at least (see Fig. 137). The second movement can be performed equally well, of course only with one hand, if the patient is recumbent, but the first movement then calls for material alteration, and is easily combined with the down stroking of the front of the neck. The masseur kneels on the opposite side of the patient to that which is under treatment. The ulnar border of the hand just touches the patient near the middle line of the forehead, and the hand is then pronated so that all the fingers come in contact with the forehead and the ball of the thumb rests over the eye of the patient. On this the hand pivots so that the fingers sweep across the forehead, pronation becoming less marked. The ball of the thumb then gradually rises and sweeps across the eye while the fingers descend the face in front of the ear. As soon as the fingers reach the lower level of the jaw the hand pronates again and is carried downwards and outwards across the neck to the shoulder. An attempt to illustrate the movement is made in Figs. 138 to 141. This is an excessively difficult movement and calls for great skill. If clumsily performed it is a source of great irritation.

The total *séance* may last up to seventy-five minutes. This is comparatively rare, and so long a time should never be devoted to treatment in the early stages. At first twenty minutes should often suffice, then the duration of treatment may be advanced by very gradual stages, and towards the end should be decreased in similar manner. The one thing above all others to avoid is fatiguing the patient. It is often possible to leave patients sound asleep. Before this stage is reached the patient is frequently in what the psycho-therapists describe as the "hypnoidal state." Verbal suggestion can play its part with greatest effect during the continuance of this condition.

It is impossible to over-emphasise the danger of using the treatment here advocated for neurasthenia in cases of hysteria, unless it is demanded by the physician as a preliminary to sug-

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gestion treatment. Used as a purely physical remedy, its great potentialities for good in the neurasthenic become almost equally powerful for ill in the hysterical. For the latter, massage treatment to be effective must partake of the nature of a moral persuasion which is little short of actual punishment. Treatment of this character is a degradation of the art of massage and should be strenuously discouraged. Electricity, on the other hand, affords a physical treatment which can often be used with the greatest of benefit in hysteria. On the individual who is liable to break out into noisy fits of laughter or crying at frequent intervals the static breeze has often a very marked sedative effect. Sparking may effectually allay hysterical aches and pains. High frequency can remove a multitude of hysterical symptoms provided the patient is properly prepared from the psychical standpoint. Faradism, by producing visible contraction, can often convince a patient that movements which he does not perform owing to hysterical "paralysis" are really within his power. This is the scientific method of dealing with these cases. As Buzzard has pointed out, it is untrue to say of the hysterical that he cannot perform an action, it is unfair to say that he will not, and so we must be content with the simple fact that he does not. If by Faradism we can ensure that the action *is* performed, we are at least on the road to cure. If, in addition, moral persuasion can induce the patient to copy the movement performed in response to the current, the cure is established.

Since the beginning of the war we have heard much about the rapid or intensive cure of various "functional" or hysterical conditions. When we consider the nature of hysteria in its widest and most comprehensive form, and cease to regard it as a sort of whim on the part of a naughty girl, there is nothing mysterious or wonderful in this treatment. It is, in fact, the natural outcome of a true understanding of conditions as they exist; and is merely rational, though, from a spectacular point of view, it may be sensational. If we regard hysteria as an illness which is characterised by a definite lesion, we shall at once realise that the symptoms—however fantastic—are none the less real, are beyond the power of the patient to control without help, and are alike due neither to, so to speak, voluntary

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imagination nor yet to insanity. At first sight it would often seem that the symptoms must be attributable to one or other of these causes. There is, however, a third possibility, and this is the true one.

Hysteria is due to a definite contraction of the field of personal consciousness, and thereby control—be it in the form of volitional movement or of suppression—is completely cut off from the higher or volitional controlling centres as by a knife. The result is varied. If the dissociation is complete, we get the extraordinary condition known as “dual personality”; if it is only very slight we get “functional” inability, for example, to open a flexed finger that has not, in reality, suffered any injury. In all cases of hysterical paralysis the part affected is entirely outside the field of conscious control, just as much as if it had been amputated. Sensation is utterly and actually lost in so far as the patient *does not* feel, and movement is impossible, until the part is brought once more within the field of consciousness.

In all cases of true hysteria there is of necessity a mental conflict. The conscious mind is convinced of the existence of a definite lesion, the sub-conscious knows that no such lesion exists. The outward signs of this conflict are various. There may be abnormal excitability or an undue placidity in accepting the disability. Some deep reflexes are almost invariably exaggerated, and particularly the knee-jerks.

Now suppose we apply massage for this condition. What are we doing? We are simply conveying to the patient's mind the fact that we believe his limb to be paralysed: we are, in other words, confirming his delusion and doing all in our power to keep the limb outside the field of consciousness. What is required is the exact reverse. The patient must be persuaded that, although control has been lost through illness, it can be regained, and that speedily, and that we know how to restore control. He must be shown that the disability is due to the fact that nerve impulses do not pass the apparent block, be assured that they *can* pass it, and then, with a little patience, he can be shown that some impulse *has* passed it. The faintest sign of involuntary movement that can be elicited is at once demonstrated, then another, and so on till cure is complete. But the cure is one of mental persuasion—mental coercion it

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may be—based on physical demonstration, and not of physical manipulation. It is, in other words, the successful result of an attempt to make the patient help himself.

Not every one who practises massage can cure a case of hysteria. The process is psychical and not physical ; it requires skill, perseverance and tact, and the person who undertakes it must come to his task fresh and ready, if need be, for a long fight. We hear of cases being cured at “one sitting.” Here are two examples :—

A patient with multiple superficial wounds of his fore-arm had all the symptoms of posterior interosseous paralysis. He had been under treatment by electricity and massage for several months. He was made to grasp a pole in full supination, then in various degrees of pronation up to the mid-position and then quickly on through all the various stages up to full pronation, when the pole was supported without difficulty in full dorsiflexion. He was “cured,” save for lack of strength due to disuse, in a few minutes. Another patient had a “functional” paralysis of the whole upper extremity of two years’ duration. It took three hours of hard work to secure voluntary movement throughout the limb, and this may be considered rapid. It might well have required six, had it not been found that, though the hand was kept tightly clenched so that at first the fingers could not be opened, the nails had been kept short. This was demonstrable proof that relaxation was possible ; having secured it, it was possible to demonstrate that active flexion of the fingers was also possible. From this point the remainder was comparatively simple.

One method of dealing with hysterical spasm is worthy of notice. It, too, is an intensive treatment, and consists simply and solely of tiring out the contracted muscles. The contracture is gradually overcome by constant pressure until full movement in the opposite direction is secured. This may take some time, but can be accomplished with patience. Massage may be invoked to assist in securing the relaxation, and should consist chiefly of firm muscle kneading and deep stroking. Evenness of movement is essential. As soon as the limit of movement is reached all restraint is removed, and the contraction returns. Immediately the process is repeated time after time, till finally,

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from sheer exhaustion, the spasm fails to return. It is often a long and tiring process for patient and masseur alike, and the pain inflicted may be very considerable. It is, however, very effective, and particularly if the patient is adequately prepared beforehand for his "cure."

Ordinary training in massage does not, and cannot, include training that shall enable the masseur to deal successfully with this type of illness, and it is not my purpose here to try to fill the gap. What I want to emphasise is this. According to Colonel A. F. Hurst, of Seale Hayne fame, hysteria should be defined as "a condition in which symptoms are present which have been produced by suggestion and are curable by psychotherapy.<sup>1</sup> If hysterical disability can be cured by persuasion so, too, can it be implanted by persuasion, and herein lies one of the chief dangers of all massage treatment.

Any illness or injury which produces any disability, however slight, conveys to the mind a consciousness of disability. To recover from this disability, mental effort on the part of the patient is essential. Without it the disability will persist, perhaps long after the actual cause of the trouble has been remedied. It may even be that recovery of function will entail voluntary effort the result of which is not free from pain. Unless the patient is taught and encouraged to regain function in spite of this, he may well regard the slightest discomfort in movement as akin to disability. He must know and realise that this is not so if he is to recover. But equally we must know how much pain or discomfort a patient may with benefit inflict upon himself: how far voluntary effort may wisely go. Attention to our three golden rules provides the solution. If there is no increase of pain or of swelling and no decrease in mobility let him persevere.

If, on the other hand, the patient relies on massage to cure him, what is the result? Let us suppose he is strong enough to abduct his arm fifteen degrees. Considerable effort may enable him to reach twenty degrees a few days later. Unless he makes this effort he will never do it, not with all the massage in the world. If he is taught to rely on massage to do it for him, he will not make the effort, and recovery will be indefinitely post-

<sup>1</sup> *The Lancet*, 1919, p. 771.

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poned ; and the masseur who inculcates the belief that massage will effect the cure is really responsible for inflicting on his patient a "functional" disability.

As has been stated over and over again in these pages, massage is merely a means to an end, and that end is restoration of function. If the function is under voluntary control, nothing but the exercise of volitional effort can ever cure the patient. Let us beware, then, lest by our attitude and actions, expressed or implied, we convey to our patients the lamentably erroneous idea that we can cure them and that all they have got to do is to let us do it for them. It is so easy to convince a patient of evil, to convey to him that his disability or weakness is worse than it really is : it is often extremely hard to convince him that these things are less than he believes. Yet unless we do this, it is not likely that he will make the effort which alone will cure him, and we confirm—or at best allow him to confirm—his disability.

If there is one motto that should be hung up over the door of every massage school it is this—"Massage alone rarely cures." Patients have to be taught to cure themselves. We can prepare the patient for cure, and render cure possible ; we can teach him how to cure himself ; but, in the long run, "cure" is dependent on the patient and his own volitional effort. Without his co-operation our best efforts are rendered void and useless.

Take, for instance, a case of constipation. However much we work upon the abdomen the patient will never be cured till he practises regular habits. Or, again, consider a case of muscular rheumatism. There is definite disability from pain. Massage can relieve the pain and assist the removal of deposits in the muscles, but it cannot cure the disability unless the patient uses his own muscles. We cannot use them for him and disability remains, until he exerts volitional effort, possibly long after the condition that caused it has vanished. Even a case of insomnia depends for ultimate cure more or less on volitional effort. The power of relaxation is lost—it is without the field of volition. We can, by massage, restore the power of relaxation, pull it back, as it were, to within the field of volition. We can teach the patient to regain the lost control of mind and body, and can show him how and why the control was lost.

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Nothing we can do can secure him from relapse, unless he voluntarily allows himself adequate opportunity for sleep in the future.

I hope enough has been said to impress the fact that "massage" does not consist of mechanical manipulation. Every patient must be made to understand the personal element in his case, and must be encouraged throughout to make every effort in his power to recover, even if the effort consists solely of voluntary relaxation. The great danger that invariably besets us, when we undertake to apply massage to a case, is that we thereby convey to the patient that we are going to do all that is necessary for him, that we thus detract from volitional effort, and so confirm or even create a "functional" condition that may be little short of hysterical.

There are always to be found a few optimistic patients who are anxious to hasten recovery more than is advisable. They are the exception, and not the rule. It is far more common to find patients erring on the side of caution, and of making too little sustained effort towards recovery than the reverse. This is not because they do not want to get better quickly; it is because of the influence expressed or implied during treatment. When patients submit to treatment at all, they naturally expect help and guidance. Many obey orders implicitly, even to the extent of omitting anything and everything that is not specifically ordered. For instance, it is not uncommon for a charwoman who is recovering from a Colles' fracture to ask if she may try to scrub a little. If she has reached the stage of recovery at which the answer is in the affirmative, what would have happened had she not asked? The attempt would not have been made, and recovery of function would have been postponed. In other words, functional disability would have been prolonged owing to absence of specific instructions. In this sense the chief sin of the masseur is one of omission: it is often more fertile of delayed recovery than that of commission.

Until the masseur realises that his duty does not cease with his manipulation, but that he must also be prepared to treat his patient's mind, to encourage volitional effort, to prescribe movements first and then activities—massage as a remedial agency will continue to fail us. The term "massage" must be

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made to include physico-therapy, and every known trade, occupation, exercise and movement must be classed under this term. It is far better, for instance, to scrub than to "exercise," or to play the piano than to drum aimlessly with the fingers on a table or in the air. The set exercise must always aim at securing some special movement or some special activity : it cannot replace the ordinary daily use. But even this wide interpretation of the term "massage" is inadequate. Not only must our work be physical, it must be psychical as well. It cannot be neutral, and the psychical effect of our treatment must tell either for recovery or against.

Let us see to it then that our influence is for good towards our patients, that we prepare the way for recovery, show how recovery is possible, take every advantage we can of what is favourable and render as slight as we can all that is unfavourable. Let us maintain to the full the preservation of function that has not been completely lost, secure the earliest possible return of movement, of co-ordination and of function when lost ; and do all in our power to preserve intact the full volitional capacity of our patients, on which alone we rely for the present rapidity of recovery and our ultimate success.

## CHAPTER XXII.

### THE TREATMENT OF FUNCTIONAL DISORDERS AND OF OTHER CONDITIONS OF UNCERTAIN ORIGIN.

IT is beyond doubt that neurasthenic symptoms may develop as a local condition. Treatment must then be carried out on the lines laid down in the previous chapter. But many cases exhibiting similar symptoms are undoubtedly hysterical. Massage by itself fails ; massage combined with other methods of treatment may succeed. It is impossible to furnish any guide as to the manner in which these cases should be approached. Everything depends on the nature of the concurrent treatment.

If a patient with hysterical paralysis is treated by solitary confinement and other severe measures, probably the best line to adopt is to administer a thoroughly vigorous—and probably equally unpleasant—dose of massage. As pointed out in the previous chapter, this method of treatment should be discouraged. If, on the other hand, the patient is being treated by suggestion, the wisest plan is to apply only the sedative type of massage there advocated, without paying any special attention to the limb that does not move. This will prepare the way for the psychical treatment and help to render the patient more receptive. This line of treatment, however, should only be carried out when the masseur is asked to work in direct co-operation with the medical man who is undertaking the psycho-therapeutic treatment of the case.

Passing on to the treatment of functional disorders in general, we find that a large group of cases have one symptom in common, namely, spasm. This may affect involuntary or voluntary muscle. Raynaud's disease and angina pectoris may probably be taken as typical of the former.

In the treatment of *Raynaud's disease* there should be two distinct methods of attack. First, presuming that the spasm is due to some nerve lesion, reflex result might be anticipated

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from surface stroking, and this should undoubtedly be given a chance. If it succeeds in nothing else it will prepare the way for the second method. This is neither more nor less than so to over-stimulate the unstriped muscle of the arterioles that, despite the command of the nervous system to contract, it is compelled to remain relaxed. Hence firm, deep massage is required, and fifteen to twenty minutes may be spent on the treatment of one limb. The benefit will soon be detected by the patient, and the results recorded in relief of pain, a sensation of warmth, and improvement in colour. The proximal portions of the limb should be treated before the distal, and every precaution should be taken not to submit a tender area to heavy treatment at the outset, but to approach it gradually. After massage every muscle in the limb should be exercised.

It is probable that *erythromelalgia* and *angio-neurotic œdema* are disorders of similar origin. If opportunity affords, treatment should be arranged on the above lines.

*Chilblains*, in the ordinary household, are submitted to vigorous rubbing. Historical evidence cannot be ignored, and this time-honoured practice must have something in its favour. On the other hand, purely local treatment of this type can only cause a local hyperæmia which is transient in character. The scientific treatment for this most annoying condition is to treat the whole limb by general massage for the circulation; aiming to secure, by both reflex and direct effect, a general toning up of the whole of the vascular system of the part. The pathology of the trouble is probably that cold, possibly combined with pressure, has caused spasm of the arterioles. Then, owing to the long-continued presence of the spasm, the muscle fibres have become "fagged out" and temporarily paralysed. There is, therefore, little to be said in favour of attempting further to paralyse them by over-stimulation. An attempt may, however, be made to stimulate the muscle to contract by the application for very short periods—say ten or fifteen seconds at a time—of vibration or percussion.

In arctic circles true frost-bite is treated by vigorous rubbing to secure vaso-dilatation, as, failing this immediate remedy,

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the cold is liable to freeze the blood in the part that has been depleted of fluid by reflex vaso-constriction.

The "*trench-foot*," with which we first became familiar in this country in the early days of 1915, is due to a combination of causes—usually cold, damp and pressure, and probably also to sepsis. In spite of the cold the condition is unknown in Labrador, and Dr. Grenfell has attributed the immunity to lack of pressure.

How far the subsequent evils of trench-foot could be avoided were it possible to administer immediate treatment by massage, it is impossible to say. When the cases arrive home the condition appears to be a combination of neuritis and of general disorganisation of the vaso-motor system. Certain it is that vigorous massage of the foot is a lamentable failure, and definitely postpones recovery.

Treatment should be administered as follows:—Surface stroking of the thigh is begun, and the stroke is gradually lengthened by including more and more of the leg, until the area of sensitiveness is reached. It is then carried no lower. The thigh is gently kneaded, and then the patient is taught to contract every muscle in the limb over which he has control. Exercise without weight—simple swinging or on the sliding-seat—is encouraged, and the *séance* terminates with firm but gentle stroking for about five minutes. Great patience may be required, and careful watch must be kept for the development of deformities, and these should be appropriately guarded against. The chief are foot-drop and the development of a valgus deformity, either of the whole foot or only of the big toe. The use of a club-foot shoe-splint at night will probably be all that is required. Care should be taken so to pad the splint that the natural contour of the sole is maintained intact. An unpadded splint of this type tends to turn the foot into a valgus position and to destroy both arches. No patient should ever be allowed to walk till all danger of developing these deformities is past. Gradually the stroking may be extended all over the foot, and then kneading may be applied to the leg with great care. Once more the foot is gradually approached. Sometimes it is possible to administer this treatment to the foot itself by grasping it firmly between the

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two hands and alternately relaxing and tightening the grip. No movement of the hand on the surface takes place (*cf.* Fig. 90, p. 172). If utilised, this part of treatment should occupy only a very few minutes.

Almost every conceivable variety of treatment has been advocated for this condition. It is impossible to compare results, as, apparently, whatever the treatment adopted, in some cases it will succeed rapidly and in others fail. The success of the above scheme when other attempts have been made and failed justifies its patient trial, as, even when it has appeared to be the last resource of the destitute, it has ultimately succeeded. Sometimes it too fails; but any other scheme of treatment by massage is almost certain to fail, and failure is usually accompanied by an aggravation of the condition. Unquestionably the most important factors in treatment are, first, to exercise to the full every muscle in the limb over which the patient retains control; and, second, to avoid placing any weight on the foot whatsoever, until muscular strength in the leg and in the intrinsic muscles of the foot has been restored.

True *angina pectoris* is usually associated with arteriosclerosis. The patient is therefore unable to take sufficient exercise, and general massage for the circulation will be of great service in aiding the elimination of waste products. Any form of local heart treatment is contra-indicated, and every care should be taken to avoid causing the faintest trace of irritation.

In *pseudo-angina* the success of massage may be very great. The trouble is purely neurasthenic, though some hysterical cases may be found to present pseudo-angina as a symptom. The treatment is general, as for an acute neurasthenic attack. It should start with two or three minutes of surface stroking to each leg. Presently the arms receive a dose, later still the lumbar region of the back is treated. The dorsal region is slowly included in the stroke, and finally the head should receive attention. Any attempt at general treatment in the early stages is liable to precipitate an attack. Local heart treatment is absolutely contra-indicated. The patient is likely to be deprived of exercise for some time, and therefore, on resuming walking, is liable to an undue quickening of heart-

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beat. This in turn is liable to precipitate an attack. Bergonié treatment, by building up muscular strength without effort or exertion, is a valuable prophylactic against relapse.

Spasm of the intestines produces colic, and is considered later (see Chapter XXVII.).

Asthma, another disease due to spasm of involuntary muscle, will also be dealt with later (see Chapter XXX.).

Cases of spasm of the voluntary muscles are seen frequently in any massage clinic. It is often difficult to deal with, and its manifestations are varied.

Roughly speaking, there are four main types—the hysterical, the “functional,” the irritative, and the occupation types.

Treatment of *hysterical spasm* has already been considered in the previous chapter. It calls for psychical or coercive treatment.

“*Functional spasm*” I am going to consider as a separate entity, though doubtless from a pathological point of view this is incorrect. There are, however, various spasms that follow minor injuries and sprains, and partake more of the nature of a local neurasthenia than of actual hysteria. They are usually due to an unfounded belief that movement beyond a certain point will cause pain. The spasm, in fact, is protective. It is, as a rule, far more easy to cope with than the more definitely “hysterical” spasms. There is one great exception, namely, the spasm which many small children develop after injury and splintage. The most troublesome type of all is the small child of three or four, who has sustained injury near the elbow-joint, and who has been treated with the elbow fully flexed. It is no uncommon event for spasm of the brachialis anticus to limit extension to a right angle. Many recover spontaneously if allowed merely to play with the arm; a few who do not do so require great care and patience. Massage is of little avail, but skilful playing with the child will succeed. It is a difficult art to learn, and the key to success is patience and constant encouragement of voluntary use of the triceps. Digging in sand is perhaps the best remedy. Force is fatal.

Slow, rhythmical stroking of the surface, passing by infinitesimal stages into firm, deep stroking, will almost

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invariably relieve spasm which is protective in nature, provided that the evil against which the protection is set up is chimera. The moment it begins to subside constant pressure is exerted very gently, so as to maintain an even tension, and thus movement of the joint that was fixed by the spasm can be performed (*cf.* Figs. 32 and 33, p. 74). The performance of the movement convinces the patient of its possibility without pain, and, as soon as active exercises can be performed after the spasm has been overcome, the patient is on the high-road to recovery. Temporary relapse is common and of no importance, provided the patient is taught to expect it. As the spasm partakes of the nature of a protective habit, it will soon vanish under treatment.

A form of spasm, usually regarded as of rheumatic origin and possibly irritative in character, is one of the symptoms of *chorea*. It is still an open question whether the disease may not be solely a functional brain disorder. Whatever its origin, the psychical disturbance is always considerable and may be very grave. The treatment applicable, therefore, is similar to that advocated for the treatment of neurasthenia. The chief alteration that should be made is materially to reduce the duration of the *séance*, though it may well be repeated twice during the day. There are two reasons for this reduction—first, that the disease is most commonly met with in children, who are much more amenable to the effects of reflex stimulation than adults ; and, second, that the instinctive effort to control the movements during the *séance* is exhausting. Massage, correctly administered, is perhaps the most effective weapon we possess in combating spasm in this disease ; but, if it is inefficiently performed, the result can only be disastrous.

A common type of irritative spasm is provided by the patient who develops a *spasmodic torticollis* as the result of pediculi in the hair. The spasm is of a clonic type, and is much more amenable to treatment than in those cases which present tonic contraction. The patient should lie on one side with a roll placed under the sound side of the neck, leaving the head itself without support except for that afforded by the masseur's disengaged hand. Surface stroking is soon replaced by deeper stroking over the sternomastoid and trapezius, and

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this, in turn, should be replaced by gentle kneading. It is important that this should be rhythmical, as every endeavour must be made to avoid causing the smallest trace of irritation. When the spasm has been relieved, or at least ameliorated, the patient may sit up. Downward neck stroking should be performed on both sides (see Figs. 131 to 133, p. 297) as a preliminary to the administration of resistive exercises to the muscles of the sound side of the neck. Success will depend on two factors—first, on the possibility or otherwise of the removal of the source of irritation, and, second, on the duration of the complaint.

*Torticollis* in which the spasm is of the tonic variety should be treated on similar lines. As a rule, however, treatment is used either to prepare the patient for operation or to restore the parts after operation. In the latter instance, exercises to strengthen the muscles of the opposite side are usually the most important part of treatment. Gentle massage may be used to prevent extensive cicatrisation at the site of operation.

The type of *occupation spasm* most frequently encountered is writer's cramp. Any occupation that entails incessant use, or rather over-use, of any muscle is liable to produce a similar spasm, particularly when the muscles concerned are engaged in the performance of some highly specialised movements which entail elaborate co-ordination. It is not uncommon for watchmakers to lose the use of their hand from spasm, and recently what might almost be called the "marcher's cramp" has been an object of great interest, but of considerable anxiety. The recruit who has "never done much walking" starts out on a route march. His heel begins to pain him, and he finishes the march on the toes of one foot. The calf then develops a most intractable spasm. It may be that the deformity produced is a pure equinus; more usually it is an equino-varus. A suitable position for treating this condition is shown in Fig. 125, p. 283. From time to time we hear of a masseur's cramp, but this can only be due to lack of skill in the exercise of his profession. Neuritis is more common, and is due to overwork. Excessive practice can produce a musician's cramp.

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Of the true occupation spasms it may be said that, by means of massage and exercises, there is an almost sure hope of successful treatment. There are, however, many forms of pseudo-occupation spasms. A victim of hysteria may develop an intense writer's cramp during, or after, the composition of a "difficult" letter; while the trouble referred to above as "marcher's cramp" has frequently a large psychical element. The treatment of the "pseudo" variety of occupation spasms by massage alone is almost certainly doomed to failure. Physical remedies rarely suffice for the cure of psychical disturbance.

A true writer's cramp may extend to very serious lengths, for, when the trouble is far advanced, all power of co-ordination in the limb may be completely lost, and the patient may suffer agonising pain from cramp, though actual pain is not by any means an invariable symptom. There may be vaso-motor changes, and the appearance of the hand may even suggest serious nerve-lesion. This is, of course, a rare development. Usually the symptoms are confined to weakness, tremor, and lack of co-ordination for the movement concerned, while all other movements can be performed with perfect ease, comfort, and strength.

Massage should begin with surface stroking from wrist to shoulder for a few minutes. Then the muscles of the arm are given a short dose of kneading, which should impart a shaking movement to the muscles. Some five or six minutes from the commencement of the *séance* rhythmical kneading of the forearm should be undertaken; but here no shaking is allowed, at least during the early stages, as it is liable to excite spasm.

Presuming that the right arm is under treatment, the masseur next takes a firm grasp of the patient's thenar eminence with the right hand, while his own thenar rests in the patient's palm. The left hand is then placed firmly over the dorsum of the patient's hand (see Fig. 142). The hands next exert gentle intermittent pressure and subsequent relaxation, but do not change their position relatively to the patient's skin. With the closing of the masseur's fingers, however, the first carpo-metacarpal joint is mobilised by the right hand, while the palm is rendered fully concave by pressure from the back by the

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left hand. As soon as this can be accomplished freely the fingers can be flexed as well. At first no movement may be noticed, but as treatment progresses an ever-widening range of movement will be secured. It should be needless to add that every care must be taken to avoid inflicting pain or even discomfort. Full exercises of shoulder and elbow, particularly of the rhythmical swinging type, should be prescribed. Later on weight and pulley or roller exercises may be indulged in with freedom. In short, any exercise



FIG. 142.—Massage of the hand in treatment of writer's cramp.

may be prescribed which does not excite the spasm, and the limb should be used with all the freedom that circumstances will allow.

As soon as it is possible to use the vibrator without exciting spasm, progress will be more rapid.

When the hand can be used with relative freedom for everything except actual writing, the patient may be presented with a thick piece of chalk, with which to practise writing very large "copper-plate" letters on a blackboard. The size of the letters is gradually reduced, and the patient is provided with a pencil. The same plan is carried out once more, and

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the following examples will serve as a guide. They are quoted from Graham's "Massage." "The patient is directed to make large *ll's* quickly and continuously, followed by the reverse of these, making *m's*, so as to make him write from the upper arm and shoulder." The size is gradually decreased, and the next exercise "consists of *lelele*, large and rapid at first, then gradually diminishing, and later the exercise *legleg*, many lines at a time." A wise additional manœuvre, when starting writing on paper, is to pad the penholder in such a manner that its bulk can be slowly reduced day by day.

Every variety of occupation cramp calls for suitable modifications of treatment. The use of massage is to enable the patient to practise exercises which alone can effect a cure.

I have found that the simple device of applying a posterior splint to the thumb so as to immobilise the interphalangeal joint has so altered the co-ordination involved in writing that a mild case has completely recovered.

I cannot refrain, however, from reference to a case in which I do not doubt that physical treatment would have failed. The patient had done much writing for many years. She was in a condition of financial anxiety when the cramp set in and, as luck would have it, was undergoing a course of psycho-analysis "to find out what it was all about." I postponed treatment for a fortnight, only to find on her reappearance that the spasm was completely cured. The analysis had reminded her of injury to her right thumb under terrifying circumstances in girlhood, at the only other time in her life when financial affairs were impressed unpleasantly upon her notice. It is possible therefore, that other cases of occupation spasm are psychical and not physical. If physical treatment fails, psychical should therefore be given trial.

A peculiar form of spasm of unknown origin is found in *Parkinson's disease* (paralysis agitans). The pathology of the disease has not been worked out; the symptoms may be classified, in a word, as corresponding to the advent of a premature old age. The muscles slowly lose strength and become contracted. The tendon reflexes are brisk. The arms become stiff from being kept almost motionless, the legs tend to develop contractures in the hamstrings, the shoulders become

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bowed, and a most distressing tremor develops in some cases, not in others. Where tremor is absent the form is known as *Parkinson's disease sine agitatione*.

The masseur's duty is plain. It consists of maintaining suppleness throughout the body by means of relaxed and assistive movements, and of rendering assistance to the circulation, which the patient cannot derive from nature's own means, namely, exercise. Every effort should be made to maintain and encourage voluntary movement to the uttermost. In the absence of effort in this direction the downfall is pitifully rapid, and quite unnecessarily so, as is shown by timely intervention. General massage of the whole body, chiefly of the kneading type, will be required. Abdominal massage should aim chiefly at assisting the portal circulation. Unstriped muscle seems to be unaffected by the disease, but the spread of the disease to the abdominal muscles may render defæcation difficult. Massage adapted for the relief of constipation may therefore prove of value.

## CHAPTER XXIII.

### THE TREATMENT OF DISEASES OF THE CENTRAL NERVOUS SYSTEM.

*Hemiplegia* is one of the most disheartening conditions that the masseur is called upon to treat. There is, however, this much of comfort for us, that, without our aid, the patient's condition would pass from bad to worse. It is only occasionally that our efforts will fail to be rewarded by evidences of actual progress towards recovery, and the gratitude received will amply compensate for any trouble taken. The patient invariably attributes to the massage the recovery that may be made, and to a certain extent he may be justified. Nature should, however, receive her meed of thanks.

It is true that, generally speaking, the right side of the body receives its innervation from the left side of the cerebral cortex, and *vice versa*. But there are inter-communicating fibres from one side to the other, and it would seem that sometimes the left side of the brain can develop a certain amount of control over the movements of the left side of the body. Patient perseverance with massage and passive movements—of necessity they must be relaxed unless contractures are present, when forced movement must be employed—are able to keep the paralysed muscles in readiness for these connecting fibres to play their part. Without our assistance the communications would doubtless take place, but the muscles would not be able to take advantage of the recovery. In any case of hemiplegia it is always doubtful at the outset how far recovery will be partial or complete ; as, even if the lesion is small, paralysis may be very marked in the early stages, apparently from "shock" sustained by neighbouring structures.

The duty of the masseur is again obvious. General massage of the deep-stroking and gentle kneading types will maintain nutrition. Passive movements will prevent contractures.

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Each joint must be treated fully and conscientiously every day. But, as has already been pointed out, paralysis is almost always more extensive in appearance than in fact. Every effort should therefore be made, even in apparently hopeless cases, to encourage the patient to perform voluntary contraction and relaxation in order to assist our movements. Thus, and thus only, can we ensure that muscles which are only temporarily affected will resume their activities, and that we keep the way open, as it were, for the free passage of impulses along fresh paths. Directly there are signs of returning power, the patient will often contract the muscles more readily if slight resistance is offered.

It is well to remember that the patient may have been leading a most active life right up to the moment of the onset of the "stroke." The sudden cessation of full activity is always detrimental to general health, and abdominal massage may add very materially to the patient's well-being. In the earlier stages, however, abdominal massage should be administered with a very sparing hand in all cases of cerebral haemorrhage, as it tends to raise the blood-pressure.

The psychological aspect of the case should also be kept in mind. The visit of the masseur should be a bright spot in the daily routine, and the moral support given in a hopeless case may be of as great importance as any physical benefit that may be rendered.

During recovery of a muscle great care must be taken to avoid fatigue from over-use, and exercise must be duly "spaced" with massage (see p. 231).

*Progressive Muscular Atrophy* is another of the "hopeless" diseases, in which massage and exercises, though they will not cure, can help very materially. The form usually encountered is known as *amyotrophic lateral sclerosis*. Generally it begins with "clumsiness" in performing some of the finer hand movements, and spreads continuously. In the early stages massage, muscle training and exercises may effect an apparent cure. This is only because the disease has still left sufficient motor fibres intact to enable us to build up the strength of the muscle fibres supplied by them to such an extent that,

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through their increase of strength, they are enabled to do their own work so well that the degeneration of neighbouring fibres passes unnoticed. It is a "losing game" in the end, but the masseur who keeps heart throughout the fight may confer inestimable benefit on a patient who, without massage, is deprived of all hope of assistance.

Massage should aim at maintaining nutrition and assisting the performance of exercises. Fatigue must be carefully avoided. All joints must be kept fully supple, as only so can the typical *main-en-griffe* deformity be averted. Contractures should be countered by every means available. The upper motor neurone may be more affected than the lower. This leads to a spastic paralysis instead of a flaccid. The difference in treatment is as follows :—

In all cases of *flaccid paralysis* wasting of the muscles is rapid and complete, and all reflexes are lost. In *spastic paralysis* the muscles may waste very little, and the muscle reflexes are all exaggerated. This gives the clue to treatment. In flaccid paralysis the muscles are in a condition of absolute relaxation and are undergoing degenerative change. The sole aim in performing massage is to secure full and efficient circulation through the muscle, for the double purpose of maintaining nutrition and of removing waste products, which inevitably collect in spite, and even because, of lack of exercise. Without exercise the normal stimulus necessary for an efficient blood supply is not provided ; deficiency of blood supply in turn allows waste material to accumulate ; and this accumulation again tends to hasten the degeneration of the muscle tissue. Hence we have a vicious circle, which can well be broken by means of massage. But the perfect flaccidity of the muscle deprives every structure in, or covered by, the muscle of the natural protection which is derived from it when the tone is normal. Hence we may regard our massage as applied directly to the blood-vessels. Keeping in mind the delicate nature of the arterioles, and that the influence of massage on these vessels is due to the response of the unstriped muscle in their walls to mechanical stimulation, it is easy to realise how simple it is to overdo massage treatment in these cases. Any excess leads to paralytic dilatation,

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which means that the stagnation of the circulation—already present to some extent as the result of the paralysis—is increased by our manipulations, and thus the very evil which we are attempting to remedy is actually enhanced. There should, therefore, be three main laws in the treatment of flaccid paralysis: first, the dose of massage administered to any individual muscle, or muscle-group, should be short, but may be repeated on the same day; second, only the most gentle and delicate touch is permissible; third, every care must be taken to avoid pressing the paralysed muscles between the fingers and the bone.

It should be borne in mind that the fact that a muscle is in a condition of flaccid paralysis may be an indication of deficiency (not of course complete) in the nerve supply to the unstriped muscle of the arterioles (which provide the muscle with blood). In cases of spastic paralysis this is not so, and therefore less care and caution is called for in treating these cases. Moreover, in such cases the muscle tone is exaggerated rather than diminished, even though the actual bulk of the muscle has diminished from lack of exercise, and thus the muscle in the walls of the arterioles is not subjected nearly so directly to pressure during massage.

Hence we see that in treating spastic paralysis we still aim at securing the same objectives, namely, to maintain nutrition and remove waste products, but that the danger now lies in inciting irritability in the muscle fibres by our manipulations. The most delicate stroking, picking-up, and possibly kneading over small areas, are therefore replaced by a firmer touch, as wide an area as possible being treated at the same time. The movement may be deep, but must be slow and even. Stroking should be firm, and a long sweep should be employed instead of the delicate movement of small amplitude advocated for the treatment of flaccid paralysis. The picking-up and kneading should be performed with the full grasp of as much of both hands as may be possible, instead of attempting to treat each minute section in turn.

In both flaccid and spastic paralysis treatment should aim at securing perfect mobility at all joints; but in flaccid paralysis every care must be taken never to stretch the paralysed muscle,

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whereas in spastic paralysis the difficulty will be to secure an adequate amount of movement without exciting spasm.

The value of massage in restoring muscular vitality has been proved experimentally by Zabludowski. He found that, when a muscle had been completely exhausted by repeated contractions in response to Faradism, subsequent rest had relatively little effect in restoring the power of contractility. After kneading, this power returned very swiftly, presumably because the waste products of muscular metabolism had been dispersed.

Moreover, Castex has shown microscopical evidence of the beneficent influence of massage on muscular tissue after injury. Lucas-Championnière thus epitomises the evidence :—

Similar injury having been inflicted by crushing, massage was applied to some cases, not to others. The latter showed :—

- (i.) Dissociation into fibrillæ of the muscular fibres, as shown by well-marked longitudinal striation ;
- (ii.) A hyperplasia, sometimes a simple thickening, of the connective tissue ;
- (iii.) An increase in places of the number of nuclei in the connective tissue ;
- (iv.) Interstitial hæmorrhages ;
- (v.) An enlargement of blood-vessels, with hyperplasia of their adventitious coats ;
- (vi.) The sarcolemma was usually intact, but, in one section, a multiplication of nuclei was seen, giving an appearance somewhat resembling an interstitial myositis.

In the massaged limbs :—

- (i.) The muscle appeared normal ;
- (ii.) No secondary fibrous bands separated the muscle fibres ;
- (iii.) There was no fibrous thickening around the vessels ;
- (iv.) The general bulk of the muscles was greater ;
- (v.) There were no signs of hæmorrhages.

In *syringomyelia*, as in progressive muscular atrophy, the masseur can often alleviate, though he cannot cure. By general massage of the deep-stroking and rhythmical kneading varieties it is possible to relieve the irregular pains

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and even perhaps to postpone the loss of thermal and tactile sensibility.

In the paralysis which follows an attack of *acute poliomyelitis* the muscles affected are perfectly flaccid. Treatment by mobilisation and massage should be commenced the moment pain and fever have abated. Delay is disastrous for two reasons : first, it is easier to prevent contractures than to cure them, and, second, while it is possible to keep any muscle fibres which will eventually recover properly nourished, the difficulty of the task is greatly increased once their vascular supply has been allowed to degenerate.

It is a well-known fact that, however complete the paralysis may seem to be at first, some return of power at a fairly early date is usually to be expected. In other words, the fibres are paralysed, not by disease of the nerve cells to which they owe their innervation, but because these cells are in close proximity to others which have suffered. It is possible that the cells are temporarily paralysed by the local inflammation around them.

Now we know that the "Saturday night paralysis" is rarely due (as a previous generation has thought) to pressure on the musculo-spiral nerve. It is usually to be attributed to falling asleep with the wrist resting in a position of extreme flexion. The forcible tension on the extensor muscles continued for only a few minutes, as anyone can test for himself, produces a decided weakening. This soon becomes more serious, and no great length of time need elapse to deprive the muscles altogether of their power of contraction.

The great danger run by a victim of poliomyelitis is that certain muscles which control a joint being unable to contract, the antagonists, by their natural tone, tend to stretch them. If the stretching of a healthy muscle can produce a complete paralysis, how much more can a similar effect be produced in a muscle which is deprived for the time being of its innervation ! Every attempt should therefore be made from the outset to keep relaxed each muscle that is paralysed, and to prevent its antagonist from over-contracting. If this is done, massage can maintain nutrition until the time arrives when any nerve-

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cell, which has not been actually diseased, can resume its function.

In this way, and in this way only, can the part be kept in a condition which will enable the patient to recover power at the earliest moment and to the fullest extent. If relaxation is not secured from the outset, we have postural paralysis added to the real paralysis ; and if massage is not employed, the nourishment of the muscle is not maintained, and wasting is rapid. Even granted postural treatment, the muscle fibres, supplied by the nerve fibres which survive, will, without the aid of massage, lack greatly in nourishment and, therefore, vitality.

Nothing need be added to what has been said as to the technique employed in treating flaccid paralysis, save to emphasise once more that no paralysed muscle should be allowed to stretch.

From the very outset every attempt must be made to secure voluntary movement, not only in the affected muscles, but also in those that have not suffered. It is in cases of poliomyelitis that the combination of muscle rest and muscle training is seen at its best. The longer the delay in starting, the more laborious is the task for patient and masseur alike. The technique has been fully dealt with. Here it suffices to add that we must beware of over-fatigue, and remember the value of "spacing" the training with massage.

Inevitably the day will come when some movement or exercise cannot be performed with a freedom equal to that of the previous day. This is a sure sign that an attempt is being made to push progress too rapidly, and the correct treatment is to maintain the muscles at rest in a position of relaxation for one or two days. Massage only should be given meantime, and the exercises should be resumed gradually.

Anyone who has had experience in the treatment of this type of case, and who has never overdone treatment, may be assured that he has not rendered full assistance to his patients ; while he who has never acknowledged that he has given an excessive dose, and eased off in consequence, has assuredly inflicted great injury on some of them. In fact the test of proficiency in re-educating a case of flaccid paralysis is the

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ability to determine the exact moment at which rest is preferable to perseverance.

Throughout treatment all joints must be kept supple by relaxed movements, and every area of the body which is not



FIG. 143.—To show how a patient wearing a cock-up splint, and suffering from musculo-spiral paralysis, may safely exercise the limb with the weight and pulley. All exercises must be performed with the back to the apparatus.

affected should be exercised regularly and freely. During movements or exercises no paralysed muscle must ever be allowed to stretch, so that great care and ingenuity are called for in prescribing. A splint on a limb need not prevent exercise, for it is generally easy to attach a cord from the weight and

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pulley apparatus to a bandage which is keeping the splint in position (see Fig. 143).

All other forms of flaccid paralysis should be treated on similar lines, *e.g.*, those due to acute myelitis or syphilitic changes. When the origin of the trouble is due to pressure by tumours or is the result of caries the outlook is very poor ; but whenever gummatous change is the cause we can maintain the nutrition and mobility of the parts affected till such a time as recovery has taken place. Without this assistance the recovery of the central lesion might be in vain as regards restoration of function.

When a nerve has been severed and sutured the treatment of the paralysed muscles is similar in all detail to that prescribed for poliomyelitis. It is important to remember, however, that the fact that a nerve has been exposed by an incision renders it liable to be caught in scar tissue. Hence our duty is to apply local treatment to the scar.

For the first three weeks after operation every care should be taken to avoid performing any movement which tends to irritate the granulation tissue which holds the wound edges together. Neglect of this precaution will add to the formation of cicatricial tissue. It is usually unwise to vibrate the area until six weeks have passed. Surface stroking and gentle kneading will help much, and fine frictions may prove invaluable if there is any evidence of local "thickenings."

Reference has been made to the treatment of *postural paralysis*, the example selected being wrist-drop following hyper-extension of the wrist.

This trouble should be treated exactly as if a true flaccid paralysis were present. Duration of the paralysis will be short if the wrist is constantly maintained in the dorsi-flexed position ; it may be very lengthy if the wrist-drop is allowed to persist. When strength is returning gentle percussion, preferably clapping, for a few moments at intervals during treatment, may prove beneficial, particularly if the disability has been only partial and transitory. Pressure paralyses will be considered in the next chapter.

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*Disuse atrophy* may simulate a complete paralysis, and may even lead to a wasting that is apparently complete. The reaction of degeneration is usually well marked if the disuse is of long duration. It is impossible to say where the lesion exists, but certain it is that there may be a complete break in the continuity of the conduction of impulses from the centre of volition to the muscles. It may be that it is possible for a muscle, so to speak, to forget how to respond to impulses which reach it. Whatever may be the cause, treatment should follow on the lines laid down for that of the postural paralyses. During the recovery stages percussion may play a prominent part, if the atrophy is not advanced.

A victim of *disseminated sclerosis* is indeed to be pitied. Unless taken by some intercurrent illness, he inevitably becomes bedridden; though, fortunately, by this time the mind is usually dulled and the patient unable to resent the condition.

Actual paralysis rarely develops, as the disease is one which affects the neuroglia cells, and the axons only suffer in late stages from the pressure.

The earlier stages are often distressing, as the youthful patient battles against the onset of vague symptoms. It is typical of the disease that its progress is in waves, so that downward progress is always followed by improvement, though the patient never arrives again *in statu quo ante*. The aid of massage is invoked at the onset of the downward wave, and soon the upward follows. The patient gives all the credit to the massage; and it is well humbly to accept it, as it provides the patient with a sure hope of relief in future attacks.

Indeed, massage can help the patient, even though it cannot cure, or even check, the progress of the disease. The general vitality is low, digestion often impaired, the bowels often act with difficulty, exercise fatigues, and the patient tends to become generally "flabby," and often at the same time puts on fat. He therefore suffers the additional evils of atonic dyspepsia, constipation, enfeebled circulation, and adiposity. All these can be remedied by massage. There are sundry other minor complaints which can also be relieved entirely,

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and amongst these are obscure aches and pains that arise from time to time.

In giving general massage for the circulation it should be remembered that the muscular tone is always increased, and that every care must be taken to avoid causing reflex excitability. Thus the limbs must be placed so that the muscles are completely relaxed, and only rhythmical movements are allowed. Percussion in any form is contra-indicated.

The intention tremor is often a great source of annoyance to the patient. Much can be done to alleviate it by re-education on lines similar to those advocated for the tabetic. The name of the disease (disseminated) implies that the sclerosis does not affect all the nerve elements. During the earlier stages of the disease those that escape can be educated to control, or even to do the work of, those that are damaged.

*Tabes dorsalis* or *locomotor ataxia* is a disease of the posterior roots and of the dorsal columns of the cord. In other words, the afferent (or sensory) system is at fault. Thus the patient loses sensation, and when this has departed from the feet he can only control their movements by the use of other senses. For instance, in walking the patient often learns to watch the action of his feet, as he is unable to detect, from the muscle and joint senses of foot and leg, what the limb is doing. But some of the patients develop optic atrophy and may go completely blind. Then the ataxic symptoms vary conversely with the severity of the visual defect. Thus a blind tabetic only becomes ataxic at a very late stage. He loses sensation in his legs as does the sighted patient ; but, having lost the use of the eyes, all the other sensory tracts are so thoroughly developed that between them they can arrange an effective substitute for vision. Then, as the controlling arcs are still all within the body, the ataxia is less marked than if a portion of the arc (as represented for example by the space between eye and foot) is extra-corporeal.

If it is possible for a blind tabetic to master his ataxia by the instinctive training of other senses, it is equally possible to teach a sighted patient to do likewise. This is the axiom underlying Fränkel's treatment of locomotor ataxia. Details of the technique cannot be given here, but one word of warning

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may find place. It is a mistake to try to "go too quick," and to begin re-education of the finer movements before the coarser are fully mastered. It is safe to add that massage and resistive movements, "spaced" into the performance of the exercises, provide an accessory of the utmost value to the patient.

But the ataxia is only one portion of the trouble, and often the least troublesome to the patient. Pain—usually referred to by the patient as "shooting" or "lightning" pain—may be very distressing. In the limbs great relief follows massage, and it may even act as a prophylactic. The same may be said of many of the various sensory disturbances of which the patient is liable to complain.

If the pain is acute, stroking massage should open the *séance*, first of the surface only, then with gradually increasing pressure. If only anaesthesia, or a sensation of discomfort, is present, the stroking may be omitted, and kneading be administered from the outset. Gentle percussion or vibration should follow, and stroking terminates the programme. The *séance* should be short, five to ten minutes being ample for the treatment of each limb.

There may be great weakness of the leg muscles, and especially of the anterior tibial group, though the wasting is rarely proportionate to the feebleness of contraction. The "paralysis," in other words, is dependent on disuse atrophy. This may advance till response to Faradism is very poor. Gentle percussion with the finger-tips may, even then, assist contraction very materially.

Treatment for the general condition is also called for, and great benefit can be conferred upon the patient. It may even be possible to restore *la joie de vivre* to one who seems to have lost it for ever. The agent to employ is general massage to the four limbs, and abdominal massage to assist the portal circulation and to stimulate peristalsis.

For the gastric crises percussion of the spine has been advocated, and it is well worthy of a trial.

Graham, in his text-book on Massage, gives an account of the experiments of Hégar to elucidate the stretching effect of trunk movements on the spinal cord. It appears that the stretching may be very material. It is an acknowledged fact

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that suspension by the neck has a very beneficial effect in tabes dorsalis, though the *rationale* of the treatment is not evident. We can only suppose that the contents of the vertebral canal are subjected to a stretching process. If this is the remedial agent, then full trunk movements should be prescribed for all tabetic patients.

## CHAPTER XXIV.

### THE TREATMENT OF NEURALGIA AND NEURITIS.

IT is seldom that *neuralgia* occurs as a separate entity ; it is usually a symptom of some co-existent malady. General debility is the most common, and, owing perhaps to their devitalising powers, cold and fatigue should be given second place. A third common cause is chronic irritation—*e.g.*, the facial neuralgia due to sepsis connected with the teeth. It may also be a symptom of neuritis, provided the nerve involved contains sensory fibres.

It is obvious, therefore, that massage treatment for neuralgia is only calculated to relieve the symptom—pain, and not to cure ; but relief is important ; and massage, used as a means to this end, is a very potent remedy.

Like most ailments, neuralgia may be acute, sub-acute, or chronic. In the acute stage the slow, gentle rhythmical surface stroking offers the best chance of success, and seldom will it fail to alleviate. If it does fail, all massage is contra-indicated. The relief of pain renders it certain that no serious organic lesion (*e.g.*, an intra-cranial tumour) is present ; failure is a strong indication that prolonged and thorough search should be made for the cause of the trouble.

When the pain is subsiding, or during the sub-acute stage, the stroking may be given more firmly towards the middle of the treatment, becoming purely superficial again at the end. No other forms of massage should be used until the chronic stage is approaching or has actually been reached. It will never come except as the result of one of two causes. Either the neuralgia is due to chronic illness, or to changes in the sheath as a sequel of neuritis. In the first instance relief will be secured by the means already suggested ; in the second, success will depend on removal of the irritant.

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Neuralgic pain, even in the chronic stage, may be sharp with acute acerbitations, or a dull chronic aching. In either case, general kneading of the parts around will aid the vascularity of the part, thus hastening the removal of waste products, and will tend to stretch any minute adhesions that may have formed between the sheath of the nerve and surrounding structures.

Percussion may be a valuable asset, but, when using it, the movements should be slow if the pain is acute, or rapid if the pain is dull. Thus the mechanical vibrator will succeed best when treating neuralgia of the latter type. When any definite "knotty" points can be felt near the course of the nerve, local nerve frictions are of great service. They should be applied for short periods only, and as an addition to treatment rather than as a complete remedy.

Prognosis depends on the conditions present. If the cause is still operative—e.g., if anaemia is marked—alleviation is all we can hope for. If the general debility is transient—e.g., if the neuralgia occurs during convalescence from some prolonged illness—alleviation may amount to cure. If there are obvious changes in the nerve-sheath, or if the pain is due to the presence of adhesions, it is right to encourage great expectations. In fact, these cases frequently afford opportunity for sensational cure. If treatment fails to produce amelioration of the symptoms from the outset, it is useless to continue; success, however small, should encourage perseverance. Thus it may be possible to save a patient from nerve section or stretching, or from alcoholic injection. No amount of perseverance will ever give more than temporary relief to a sufferer from the after-pains of herpes.

*Neuritis* is the name given to all inflammatory conditions of nerve-fibres. It may affect motor or sensory nerves, and may be multiple or local.

Multiple neuritis is a symptom of chronic poisoning. It may appear as a sequel to certain diseases, the most common being diphtheria; or it may be due to continued dosage of poison—alcohol, lead, and arsenic being the chief offenders. The poisons that accumulate in the body during the later

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stages of all chronic illnesses may produce a multiple neuritis, and even over-exertion may suffice.

Whatever may be the origin of the trouble, the outlook in cases of multiple neuritis is usually good, though where it follows diphtheria the condition may be very grave and even fatal. Treatment should be conducted on lines similar to those mapped out for the treatment of flaccid paralysis. Alcoholic neuritis may be accompanied by the most intense pain. When this is present treatment must be postponed, as no form of massage can be tolerated. The whirlpool bath might give relief; it certainly merits a trial. If successful it would often save many months of wearisome inaction, during which wasting steadily progresses. When the pain is subsiding, downward surface stroking can be used long before any other form of massage. This prepares the way for other methods. Passive movements should be administered to all joints regularly. Strict obedience to the law, that no paralysed muscle is ever to be allowed to stretch, will effectively prevent the onset of contractures. In all cases of multiple neuritis it is, for some reason unknown, wise to give a much more guarded prognosis for recovery in the case of the long extensor of the great toe than in the case of any other muscle.

It is probable that the neuritis which follows the prolonged absorption of arsenic or lead can be benefited in two ways by massage. Local treatment maintains the nutrition of the muscles, and so keeps them in readiness for the day when the innervation is re-established. General treatment, by assisting elimination of waste products, also hastens the excretion of the poison. Thus in all cases of arsenical poisoning, or of plumbism, general massage should always be given as well as local treatment, and special attention should be paid to assisting the portal circulation (see Chapter XXVII.).

Local neuritis of motor nerves is due to cold, trauma, or involvement in the general inflammation which is spreading from surrounding structures.

*Bell's palsy* furnishes the most frequent example of neuritis due to cold. The paralysis is sudden and complete, and the wasting of the facial muscles is very rapid. Massage treatment

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is usually postponed for a month or six weeks from the onset. The theory is that the nerve trunk, being inflamed, should not be subjected to manipulation. Probably this is true, but it is no reason why the nutrition of the paralysed muscles should not be maintained. Moreover, in spite of the fact that the face is affected, it is quite possible to maintain most of the muscles in a state of relaxation. A small hook placed at the angle of the mouth and attached to the top of a similar hook running behind the ear will prove of the greatest assistance. Massage as prescribed for flaccid paralysis should be given, and, during the stage of recovery, exercises should be prescribed while the patient stands in front of a looking-glass. Assistive and even resistive movements can be given with ease. Prognosis depends, as a rule, largely on the duration of the paralysis before treatment is begun. Recovery may take place even after the trouble has persisted for twelve months. Throughout the early stages the region of the nerve-trunk should be avoided. In the later stages vibration over the mastoid process may be used, in the hope of loosening any adhesions that may have formed in the Fallopian canal. This treatment should be postponed till at least six weeks have elapsed since the onset of the paralysis.

Paralysis due to *traumatic neuritis* of recent origin should always receive immediate treatment. The injury may be due to a blow on the nerve, the ulnar nerve in every-day life, and the facial nerve after the performance of a mastoid operation, affording frequent examples. All forms of crutch and stick paralyses are also due to traumatic neuritis. Again, the nerve may receive a severe contusion without suffering direct injury, as when a bullet passes through the thigh close to the sciatic nerve.

The paralysis is immediate and of the flaccid type, and its completeness depends on the severity of the injury, varying from an almost imperceptible weakness to complete loss of power. Treatment should follow the lines already mapped out for flaccid paralysis ; but, if the trunk affected is that of a "mixed" nerve (as is almost invariably the case), treatment may require modification owing to neuritis of the sensory element. The return of the motor power is rapid and complete,

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provided that complications do not arise as the result of the involvement of the nerve in cicatricial tissue.

Traumatic neuritis of a sensory nerve is often very troublesome to deal with, particularly during the stage of recovery. Soon after the accident treatment should follow the same lines as that mapped out for all recent injury, namely, local kneading to check effusion and to prevent further swelling, followed by the application of a thick pad of wool fastened into position by a tight bandage. General surface stroking concludes the *séance*.

When effusion has taken place, surface stroking is succeeded by kneading of the limb, the tender area being slowly approached. Over this area a broad grasp with the palm of the hand, and gentle kneading without actually moving the hand on the surface, will be more readily tolerated than local kneading, say, with the two thumbs.

Presuming sensation to have been destroyed, there will be no great difficulty until recovery is taking place. Then the treatment must be regulated by the condition. Some patients suffer a dull, constant, aching pain, and surface stroking will prove to be all that is necessary. Care should be taken to avoid sensitive spots during the earlier stages. These are slowly approached as sensitiveness decreases. Other patients suffer no pain unless the part supplied by the nerve is touched, when even the touch of clothes may be painful. For this type of case stroking is useless, but a firm grasp and firm kneading often afford great relief. In a third type no form of massage can be tolerated, and then the whirlpool bath may prove invaluable.

In the later stages, any time after the lapse of four to six weeks, vibration should receive a tentative trial, particularly if any thickening of the nerve can be detected, or if pressure or tension at any point gives rise to pain. The vibrations should begin some distance away from the painful area and should gradually approach the spot. If the nerve is deep-seated, shaking will have the desired effect. Frictions over any definite nodal swelling will sometimes prove effective when every other movement fails, but the movement should be started very gently and the pressure be carefully graduated.

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One cause of *brachial neuritis* calls for special mention. It is frequently overlooked, and is easily cured by massage, provided too long a time has not been devoted to other remedies. It is a form of pressure neuritis, and is due to carrying the shoulders too low and too far "set back." It is usually accompanied by lordosis. It would appear that the clavicle, being depressed and carried backwards over the first rib, decreases the space, between the two bones, which is occupied by the subclavian vessels and the brachial plexus. There is probably no actual pressure of the nerve trunks against the bones, but the whole plexus is confined within too narrow limits. It may be said at once that all treatment will fail, unless the trapezius and serratus magnus are educated to keep the outer end of the clavicle elevated and the shoulder girdle drawn bodily forwards. Unfortunately long rest in bed has usually been prescribed, and thus the muscles have been allowed to weaken, and only static, not active, means have been taken to relieve the pressure. The result is that, on resuming the upright position, the former conditions, which caused the pain, are restored. Muscular re-education will in such cases usually be attempted too late to do more than alleviate, but it is still possible to confer great benefit. Thus it is always well to consider this possible origin of the trouble whenever called upon to treat an intractable case of brachial neuritis. Manipulation of the cervical spine as a possible cure for brachial neuritis will be considered in the following chapter.

Little or nothing can be done by massage to relieve neuritis due to organic disease, such as malignant tumours, aneurism, or caries. When paralysis follows pressure on the cord due to caries, massage can aid the nutrition of the paralysed limbs and contractures can be prevented. Surface stroking is occasionally of service and may be given a trial. It is unwise to persevere with any form of treatment by physical methods, unless benefit is definite and immediate. Relief, however trifling, should encourage perseverance; failure to secure it indicates that treatment tends to aggravate the evil. One form of pressure neuritis can be greatly alleviated by massage, that is, when pain in the leg, or spasm of the calf muscles, is due to intra-abdominal pressure during the later stages of

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pregnancy. Firm stroking and gentle kneading of the whole limb will often secure complete relief.

Neuritis caused by the involvement of a nerve in scar tissue is invariably troublesome. The only hope of cure is to shake the nerve free. Vibration is the chief remedial agent at our disposal. In its application the utmost tact must be displayed. One example of this troublesome condition must suffice, so let us take, for instance, the neuritis that follows amputation of the fingers. A most disabling condition arises from the pain experienced at the site of the wound, when one of the digital nerves happens to have been caught in the stitches and has thus



FIG. 144.—To show the grip for rolling the flesh of a digit to loosen the tissues when a nerve has been caught in the scar.

become firmly embedded in the scar. Baths and stroking may relieve the pain for the moment ; they will not cure. Ionisation may do the same, but the great hope of permanent relief lies in vibration. Local treatment will aggravate the pain, and it is essential to avoid the stumps altogether during the early stages. The vibrator should be applied to the hand near the wrist, if, indeed, this can be borne in comfort ; if not, treatment must begin on the forearm. The fingers are gradually approached until the patient complains of discomfort. Then a slight withdrawal must be made. The whole palm and back of the hand must gradually be included, and finally the adjacent fingers, before the injured digit itself is treated. As soon as the vibrator can be tolerated close to the site of the scar, the

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flesh of the finger can be submitted to a rolling movement, which is best imparted by using the two forefingers (see Fig. 144). One of the most troublesome elements in the treatment of this condition is the fact that pain not infrequently persists only in the patient's memory. This is known as "memory pain." It may, of course, be present in any condition where pain has been a prominent symptom. Diagnosis is difficult in the extreme, and physical treatment, of course, tends to confirm it. Sooner or later the attentive masseur will notice that the painful spots can be touched with impunity when the patient's attention is distracted. Psychical treatment is then indicated.

Massage treatment for *metatarsalgia* (Morton's disease) is useless by itself; as an adjunct to remedial exercise it is invaluable. The pain may be due to a pressure neuritis, the digital nerves being pressed upon by the heads of the metatarsal bones, the fourth being the chief offender. A tight boot may compress the nerves between the heads of the fourth and fifth metatarsals. The pressure is made possible by the dropping of the anterior metatarsal arch. More commonly pain in this region is due to bruising of the heads of the metatarsals or to traumatic arthritis. While there is no weight upon the foot there is no pain, so treatment must aim at correcting the deformity. Sometimes great relief can be secured by strapping the arch with adhesive plaster or with a broad band of elastic; this alleviates but does not cure. The foot should be encircled obliquely just behind the heads of the first and fifth metatarsals. Beneath the elastic or strapping a pad of felt should be applied to fit accurately the concavity formed by the heads of the bones. Further details of treatment will be given in the chapter dealing with deformities (see Chapter XXXI.).

Occasionally neuritis may affect other portions of the foot. Sometimes the whole sole of the foot may become intensely sensitive after any prolonged illness; in other cases the heel only may suffer (pododynia). These complaints are probably a true neuritis. In treatment the whirlpool bath should invariably be given a trial as a preliminary to massage, and the latter should take the form of surface stroking, the sensitive areas being gradually approached *via* leg and dorsum of foot.

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As tolerance is acquired, deep stroking, vibration, and kneading follow in this sequence, and treatment should progress till all forms of percussion massage can be given freely.

Non-traumatic neuritis of sensory nerves is due to toxicity or joint disease. The latter type will be referred to later when considering the treatment of osteo-arthritis. Sciatica may be taken as typical of the former.

There has been, probably, more dispute as to the efficacy of massage in cases of *sciatica* than in any other form of illness, for which massage is commonly prescribed. Physicians as a rule are very chary in prescribing it at all, and very few indeed will do so during the earlier stages. The truth is that, in the early stages, neuritis affords excellent opportunity for the abuse of massage treatment ; and, later on, transitory increase in the symptoms may be inseparable from recovery. This may appear to be an injudicious statement, but few physicians would expect complete and instant cure of pain to follow exploration of the nerve and violent stretching, or even simple stretching, under an anaesthetic. Massage or manipulation likewise cannot afford immediate relief, as if adhesions have formed they must be broken or stretched, and this cannot be done altogether painlessly. The whole art is to accomplish the feat with the minimum of discomfort. This can only be done by starting treatment with the utmost care and gentleness, gradually increasing its severity as the patient's condition indicates the possibility. Cupping, as described on p. 370, will often pave the way for other forms of treatment, particularly when applied to the gluteal region.

In cases of long standing nothing can compare with massage as a remedial agent. After operation, or sudden stretching, adhesions will almost inevitably re-form, whereas slow, gradual stretching by manipulation should inflict no damage which entails repair in the shape of re-formation. On the other hand, if any attempt is made to hasten recovery unduly, actual rupture of the adhesions may take place ; and, in that case, the continued vigorous manipulation of the structures, which have been subjected to this recent injury, may well aggravate the condition. Attention to the law of treatment, that

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all points which are hypersensitive are the last that should receive attention, will avert catastrophe.

Treatment, therefore, should begin on the front of the thigh. The quadriceps should be kneaded gently, and should then



FIG. 145.—To show position for treatment of a case of sciatica, the “cure” being well advanced.

receive a thorough shaking as soon as the condition permits. Treatment of the calf on similar lines follows. Then, and not till then, may “local” treatment of the nerve begin. The preliminary stages may be passed through during the first twenty minutes of treatment, or may require as many days. The same routine should be followed on the back of the thigh

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while the foot is well elevated on a pillow. As the condition improves the elevation is decreased day by day till the limb rests in the horizontal plane. The patient now lies close to the edge of the bed, and the foot is slowly lowered over the



FIG. 146.—The end of the movement shown in Fig. 145.

side, while the kneading and shaking continue. As soon as an angle of some 45 degrees with the horizontal has been reached, treatment is more simply conducted with the patient supine. The knee is flexed and raised till the thigh is perpendicular, and thereafter full flexion of the thigh on the trunk can be effected, the continuance of the kneading and

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shaking assisting the process. The knee is then straightened by slow stages, and finally the foot is dorsi-flexed (see Figs. 145 to 147). By following some

such scheme as the above, a case of many months' standing may yield to treatment in a few weeks or even days. To hurry is to court disaster. Pseudosciatica, due to "sacro-iliac strain," is considered in the following chapter.

When it is evident that any adhesions which may have been present are yielding to treatment, search should be made throughout the whole course of the nerve for any tender points or for "nodal" formations. These may be subjected to frictions, but treatment must start very gently, and the increase of pressure must be graduated with the utmost nicety. It should always be remembered in this connection that symptoms of subacute sciatica may be due to a fibrositis of the gluteus maximus and medius. Tender points over these muscles should therefore be sought out and treated.

FIG. 147.—To show how the foot naturally passes into plantar flexion when the hip-joint is flexed, the knee being fully extended. Dorsi-flexion of the ankle adds materially to the stretching of all structures on the back of the limb.<sup>1</sup>

All other forms of neuritis of long standing should be treated on similar lines, as, for

<sup>1</sup> Prof. M. L. Rimbaud has described a frequent sign of sciatic nerve trouble. This is partial obliteration of the hollows on either side of the tendo achillis (*effacement rétromalléolaire*). It is particularly obvious if the internal popliteal element has been involved in injury or by disease, and is probably due to loss of tone in the muscles of the calf.

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example, occipital and supra-orbital neuritis. Here vibration may replace shaking.

The cause of the pain of *coccydynia* is unknown. It may be due to a pressure neuritis affecting the small nerve filaments which lie in the periosteum. A chronic periostitis may cause the neuritis. Or, again, it may be due to adhesions in or around the joints. Whatever may be the cause, gradual approach with the vibrator will often cure, even when all other remedies have been tried and found wanting.

Before any other line of treatment is considered a rectal examination should be made, and each joint of the coccygeal region should be firmly manipulated throughout its full range. A firm grip can be secured between the index finger in the bowel and the thumb outside. Flexion and extension are the main movements, but a small amount of rotation is possible and must not be overlooked. Severe and long-standing cases can often be cured permanently at one sitting by skilled manipulation. In other cases the symptoms may return, but manipulation again secures relief for a considerable time.

In the acute stage of sciatica and of other forms of neuritis the advisability of using massage is a moot point. The trouble is inflammatory, and in the presence of acute inflammation massage is contra-indicated. But the cause of the inflammation is rarely due to any micro-organism, and so the danger of inflicting injury on the patient by massage is more imaginary than real. In fact, it may be possible at times to abort an attack, if treatment is administered within a few hours of its onset. Surface stroking of the anterior aspect of the whole limb should be succeeded by deep stroking and by kneading in turn as each becomes tolerable. The patient then assumes the prone position, and the process is repeated on the back of the limb. Relief must be progressive throughout, or treatment must be abandoned.

If the attack has lasted more than twenty-four hours before the first dose of massage is given, it will probably be found impossible to administer this full treatment, but all the manipulations which are possible without removing the patient from the supine position can be performed, and thus the circulation of the whole limb can be improved. This will hasten

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the removal of the cause of the irritation. Later on a more complete treatment can be administered.

Brachial neuritis, for some reason, does not yield successfully to treatment to the same extent as sciatica. Whenever treatment fails to relieve, absolute rest is indicated. But even so massage can help. It has been proved on countless occasions that abdominal massage hastens the elimination of waste products; and, whenever it is possible to procure it for them, no sufferers from neuritis should be deprived of this means of assistance.

Dr. Goldthwait, of Boston, Mass., pointed out to me the importance of taking into consideration the value of postural treatment for this type of case. When the head is carried with a forward stoop and the shoulders are held well back, correction of posture will often be found to afford relief. The chance of being able to relieve by manipulation of the joints between the cervical vertebrae will be considered in the next chapter.

## CHAPTER XXV.

### SACRO-ILIAC " STRAIN " AND " SUB-DELTOID BURSITIS."

IN September, 1919, I had the good fortune to visit, by invitation, the United States of America. Unfortunately, I was only able to spend slightly less than two months in the country. During this time it was my privilege to visit a large number of medical men (privately and at their clinics) throughout a triangle whose angles are situated at Rochester, Minnesota; Boston, Massachusetts; and Washington, D.C. I was able, therefore, to carry through a considerable amount of investigation on the subject of physical therapeutics; but time being limited, I chose particularly as objects of inquiry sacro-iliac and sacro-lumbar "strain" and "sub-deltoid bursitis." I had heard frequent reference made to these conditions by many of the American surgeons whom I had met during the War, and my selection of them as subjects for investigation was due to this and to the fact that I had barely even heard mention of them at home.

The number of medical men who take any interest in physical therapeutics in the United States is surprisingly small. Nothing could have exceeded the kindness and courtesy shown to me by those I visited, or the trouble taken by them in demonstrating cases, and the various methods by which they are treated. I cannot feel, therefore, that it is owing to lack of opportunity or observation that the conclusions I was able to draw were indefinite, and that I have failed to return with any very clear-cut ideas. Rather I must attribute these things to the fact that in America, as well as at home, medical science has still much to learn on these and kindred subjects. I feel, however, beyond doubt that I have been shown the glimmerings of many important truths; and although without further experience my ideas must necessarily be unformed and raw, and though present conclusions may be liable to revision, I

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feel so convinced of the extreme importance of these fields of investigation, that I am compelled to insert the present chapter, although perhaps the material on which it is based has nothing, strictly, to do with massage.

Amongst the surgeons I visited I found the widest difference of opinion, ranging from those who hardly regard the conditions of sacro-iliac "strain" and "sub-deltoid bursitis" as worthy of attention, to those who consider them as responsible for an almost limitless variety of aches and other ailments. Even amongst those who hold the latter view there is a wide divergence of opinion, not only in detail, but even in the essentials of treatment. To take one instance only. In three separate clinics the condition known as sacro-iliac "strain" is treated by three different kinds of belt, and in each case the belt prescribed is regarded as the one and only satisfactory cure for the complaint. In a fourth clinic the use of belts of any sort is anathema, and reliance is placed almost entirely on manipulation.

In all four of these schools the existence of such things as gout, muscular rheumatism and fibrositis, as pathological conditions producing definite symptoms, is readily disregarded; while, on the other hand, those who pay little attention to sacro-iliac "strains" look upon these conditions as solely responsible for the production of the symptoms elsewhere attributed to "strains." Rarely did I find a definite distinction drawn between referred pain and pain due to local infiltration. Almost invariably the possibility of one or other condition being present seemed to be ignored. Time did not allow me thoroughly to investigate the various schools of thought in these matters, and my remarks upon them are therefore given with all reserve.

It was with great interest also that I investigated, as far as time allowed me, the work of the osteopaths and the chiropractors. Co-related to the practice of the latter irregular practitioners, it is impossible to overlook the high value placed upon the manipulation of the back in Swedish manipulations, and particularly by percussion in its various forms.

In sum, then, my investigations left me confronted with this problem. There are three schools of thought. In the first,

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sacro-iliac "strain" is held to be of trivial importance; in the second and third it is held to be of great importance, though the remedy extolled differs. As a result of sifting the evidence placed before me I think that, beyond all question, those who tend to ignore the existence of sacro-iliac and lumbar "strain" are wrong. If either of these conditions exists, the only problem is: Are they to be treated by support or by manipulation? In the second school the wearing of a belt is prescribed as the remedial agent, and in the third the choice falls on manipulation. Is there any possible manner in which these two schools can be reconciled, or do they together or separately give any definite contribution to medical science? At present I incline to the opinion that both methods of treatment are efficacious in suitable cases, but equally I am convinced that both can be injudiciously applied.

The first point to consider is: What is meant by sacro-iliac or lumbo-sacral "strain"? The less educated among the osteopaths and, I believe, almost all cheiropractionists labour under the delusion that the symptoms for which they apply treatment are due to gross displacement of the vertebræ, though it is rare to hear the displacement referred to as a dislocation, "subluxation" being the usual term applied.<sup>1</sup> Many are too ignorant to be able to define exactly what joints are supposed to be displaced, failing to distinguish between the joints that separate the articular processes and the joints between the bodies of the vertebræ. In one school of osteopathy, and I believe in more than one, teaching is definite on this point. It acknowledges that minor displacements of the inter-vertebral joints are impossible, and attributes all the evils for which treatment is applied to "subluxation" of the joints between the articular processes. All, however, are agreed that minor displacements of the ilium on the sacrum, or *vice versa*, do actually take place. Explanation of the effects of subluxation varies, though nearly all agree that it causes "pressure on the nerves." On what nerves is not usually specified. Granted

<sup>1</sup> It is interesting to note that, in osteopathy, a "subluxation" is defined as "an immobilization of a joint in a position of normal motion, usually at the extremity of a given movement." (See *Osteopathic Mechanics*, by E. F. Ashmore, D.O.). Thus no movement beyond anatomical limits is held to have taken place when this term is applied.

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the pressure, the explanation of its effects varies with the educational training of the person delivering the explanation.

Amongst the osteopaths there are at least three schools of thought. One claims that the nerves convey vitality to the tissues, and that any pressure upon them so lowers the vitality of the tissues supplied that disease or pain follows as a matter of due course. These people claim that they can cure practically anything by their manipulation ; and, amongst other things, I have heard it stated positively that acute appendicitis, pneumonia, and a severe cold in the head will all yield rapidly to manipulation. The argument is that the nerve pressure has so lowered the vitality of the appendix, the lung or the mucous membrane of the nose that infection has been rendered possible, while relief of the pressure so restores vitality that spontaneous recovery takes place. This school is an unquestionable danger to the public. The testimony of countless medical men regarding the disasters, which frequently come under their notice following treatment, is so overwhelming as to be decisive as to the reality of the danger. There can, I think, be little doubt that success in these things comes in spite of, and not because of, treatment. Failure I should not attribute to the treatment, though many do so. This view seems to me to pay too great honour to it : it admits a potentiality for evil in these things. This I doubt, and prefer to regard the manipulation as innocuous—impotent alike for good or evil—and to attribute failure rather to lack of appropriate medical care and attention. Thus, it seems to me, manipulative treatment in these cases is probably inoperative, save in so far as it acts as an impediment to appropriate medical or surgical treatment. The same may be said of many other complaints that these people claim to cure, and this is a heavy accusation. There is worse still, however. Not only do they impede or prevent recovery by substituting a useless treatment for valuable therapeutic measures, but active injury is not infrequently done, particularly in cases of tuberculosis, cancer, scoliosis, in such general diseases as renal or cardiac affections, and also in acute rheumatism, gout and osteo-arthritis, to quote only a few examples.

The second school holds that the nerve pressures cause pain by direct action, and, by reflex, can cause almost any trouble

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not due to recognised infective processes. This is a far less dangerous doctrine; and, were gross displacement of the joints possible, would be quite tenable. It is, however, almost inconceivable that, short of the most severe injury or disease, sufficient displacement can take place to cause pressure on the main nerve trunks, and so produce definite symptoms.

The third school, probably quite rightly, ignores the possibility of all gross displacement except as the result of grave injury, but claims that a very minute amount of displacement affects the sympathetic system, and this gives rise to such complaints as headache, neuralgia and neuritis, if in the cervical region; to chronic irritating cough in the dorsal, and to a variety of ills in the lower part of the back, including "lumbago," "sciatica," and constipation, to quote only three. They still, however, maintain the theory of definite subluxation, and that cure depends upon "reduction."

In the midst of so much doubt and speculation it may well seem ill-advised to advance any other theory, yet two facts seem to stand out with startling distinctness. First, anatomical study of the bones and ligaments of the spine shows clearly that nothing short of considerable force could possibly cause marked displacement; and that, should the requisite force be exerted, it would act so powerfully that the occurrence of minor injury would be almost inconceivable. Actual experiments have further tended to confirm this view.

The second fact which, to me, seems to have been established beyond cavil or refute by definite evidence placed before me, is that countless patients have received relief from symptoms as the result of wearing a low belt-support, or as the result of manipulation, when all other methods of treatment had failed them. Is there any possible way of rendering these two facts compatible? I think there may be.

Dr. Joel E. Goldthwait, in Boston, was kind enough to show me many specimens, and one in particular arrested my attention. The lower articular facets on the articular processes of the last lumbar vertebra did not correspond on the two sides. One was sharply convex and the other almost flat. Now, if we examine the lower articular facets in the lumbar region, we find

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that they are sharply convex from side to side, while those on the upper surfaces of the articular processes of the vertebra below, with which they articulate, are equally concave. Moreover, the joint line between them is more or less vertical. This means that, were rotation possible, the centre of movement would be more or less at some point either in, or in line with, the spinous process. Rotation is therefore normally impossible. In the thoracic region the shape of the facets would place the centre of movement almost in the centre of the body of the vertebra, and a limited rotation is there conceivable. As we ascend to the cervical region rotation becomes more and more possible, till finally we meet the pivot joint between atlas and axis.

If we suppose for a moment that the curved surfaces of the articular processes are in perfect conformity, movement in the direction intended by nature is the only movement possible, and (so far as the bones are concerned) must be perfectly free and smooth. If, on the other hand, there is the least variation in contour on the two sides, the movement on one side cannot fail to be eccentric when compared with that on the other. Is it not possible, then, that a minute anatomical defect might, by allowing eccentric movement, cause a locking or "jamming" of the joints on the two sides? This would tend to produce an arthritis, and would at once give rise to reflex spasm, particularly in the deeper muscles of the back. There could not fail then to be reflex irritation of the nerves that supply the joints; and possibly also of the nerves which supply the muscles which are thus kept in spasm; and of the nerve trunks which pass out in the vicinity of these muscles.

Passing on to the consideration of the therapeutic measures employed for the relief of symptoms, it would not seem improbable that these tend to confirm the view here suggested tentatively. The relief of pain that sometimes follows the application of a belt is rapid, and corresponds exactly to the relief experienced by a patient, who has sustained fracture, as the muscular spasm subsides. The spasm, according to this view, would be protective, and would owe its origin to a reflex attempt to secure the patient against any movement which would tend further to tighten the "locking." Similarly, relief

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of the spasm would tend to "release" the "locking" spontaneously, provided it were not too firm.

The relief which follows manipulation is sometimes so rapid as to be instantaneous, and follows an audible "click"—dear to the heart of the bone-setter. But, to the medical man, the method of manipulation is of deep interest. In one school of osteopathy—as I should judge from my limited experience, unquestionably the best—the manipulation (speaking quite generally) aims at securing rotatory movement for relief in the lumbar region, and antero-posterior movement in the thoracic.

The following is a brief description of the manipulation practised in this school of osteopathy. The patient sits on a stool with the hands resting on the lap. Careful inspection may reveal inequality in contour of the two sides, and even exaggeration of the usual curves of the spine. The dimples in the region of the posterior superior spines of the ilia may be of unequal depth. The muscles of the back are then examined minutely to detect any difference in resilience. If resistance to palpation is increased at any spot, it is held to indicate that some of the muscular elements beneath the fingers are in a state of undue contraction or spasm. It is needless to mention that the variations to be noted are often very minute, as only some of the deeper muscles are affected in slight cases. I am quite prepared, therefore, to admit the claim made by many who practise osteopathy treatment—one is a well-known surgeon—that considerable skill is required to detect the differences which must be noted during palpation. Deeper palpation follows, and is performed with the object of detecting the presence of any painful spots. Firm palpation of a muscle which has been in spasm for any length of time is always painful to a greater or less degree, according to the severity of the spasm and its duration. The mobility of the spine is then noted during every conceivable variety of trunk movement. Any limitation is duly noted. One curious fact was demonstrated to me. If a movement was limited in any direction at some particular point, or if pain was felt at this point (even though no definite limitation of movement could be detected), the skin in this neighbourhood can often be seen to have flushed as a result of the previous palpation. This, to me, most unexpected

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demonstration seems to lend credence to the theory that "locking" or "displacement" has some definite effect on the sympathetic system.

Manipulation of the spine has, as its objective, a pushing towards the sensitive—perhaps it is well not to call it the "painful"—area, the tip of the spinous process nearest to the point of maximum sensitiveness. To effect this in the lumbar or sacro-iliac regions, the hands are folded on the back of the neck and the trunk is then swung round, as it were, the axis of a cone, the apex being situated at the tip of the coccyx. As soon as the patient submits to the movement (which is counter-clockwise for a right-sided sensitiveness and clockwise for a left-sided) without definite opposition, pressure on the spinous process of the vertebra which is supposed to be at fault is made vigorously during that part of the swing of the trunk which is best calculated to assist the movement desired. In the thoracic region the patient sits on the stool, and the practitioner's knee, guarded by a pillow, is placed against the offending bone. He then passes his hands under the patient's axillæ and clasps them behind the nape of the neck. The latter is then rolled rapidly forwards and downwards, while the whole trunk is drawn back forcibly on to the practitioner's knee, which effects a strong counter-pressure. In the cervical region the patient is placed recumbent, with his head and shoulders over the edge of the couch. The head is then grasped for examination and manipulation by the fingers of both hands, one on each side of the occiput, and by the thumbs just behind the angles of the jaw. It is surprising—I had almost written terrifying—at first to discover the enormous extent of the range of movement possible in this position. Lateral pressure is exerted with the finger-tips on the spinous process that is supposed to be at fault at some one point of the general mobilisation. The idea, of course, is to catch the muscles which are in spasm as far as possible off their guard.

The practice varies, though the objectives of all spinal treatment appear to be similar. Some try to "push the spinous process" of the offending vertebra "into place" by more direct and primitive means. In these schools the patient is placed prone for manipulation of any part of the back, except

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the cervical, and for treatment of this region the sitting position is chosen. The patient is then encouraged to relax—an impossible proposition in the latter instance. Having "secured relaxation," a sudden and sharp pressure is administered in the desired direction, perhaps with the tip of the thumb, with the ball of the thumb, or even with the knuckles of the clenched fist. Patients were practically unanimous in declaring that the former method of manipulation described above is practically painless—even when it is accompanied by the loud "click of reduction." This alternative method, however, is variously described; though only once, I believe, did I hear it referred to as "extremely painful."

Far otherwise, however, are the references I have heard to the manipulations of certain chiropractors. "Torture" is by no means an uncommon expression to hear used. I never actually saw cheiopraxis in process of performance, and can only speak of experiences as narrated by patients. There seems to be a wide divergence of practice; but that of one school may, I imagine, be taken as typical. The patient is placed prone on two stools—one supports the chest, and the other the thighs. Vigorous percussion is then performed for ten minutes over that part of the back which is opposite the gap between the stools. Other chiropractors add the second method of manipulation referred to above to their technique; while yet others seem to rely on this as the main remedial agent, and use the percussion as a sort of side-issue, for some reason which I have not been able to fathom. Still, in the background is the idea of "reducing a displacement," though how the plain percussion is supposed to effect this I do not know. A few patients have told me of the relief they had received in spite of what is almost universally regarded as, to say the least, this unpleasant treatment. Far more, however, reported failure to note improvement, while not a few were apparently rendered definitely worse.

It is hard to judge how many of those who appear to have received benefit recover in spite of, rather than because of, the treatment. I am inclined to think that, when sole reliance is placed on the percussion, the assistance received cannot be great, save in very exceptional circumstances. A certain

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number of patients will always recover as the result of any treatment, provided they have any faith in it. Others will, improve in spite of treatment, however deleterious we might reasonably expect it to be. Making due allowance for this number, cheiopraxis, which does not include manipulation, seemed to me to have done far more harm than good, while the manipulation of the spine in the prone position when dealing with the lower part, and in the sitting position when treating the upper, seems, on the whole, to be more unpleasant and to have less chance of conferring benefit than when the manipulation is performed in the manner first described.

Be these things as they may, this much is certain. There should be a place in treatment for manipulation and for belt-supports ; and, until each remedial agent has been awarded its proper place, there will continue to exist a large amount of preventable suffering.

The use of a belt sometimes fails, sometimes relieves for a time, and yet, again, sometimes cures completely. When it cures, the only possible explanation is that the application of the belt has sufficed to relieve the spasm, and thereby has allowed the cause of the spasm—be it “displacement,” “locking,” or “strain”—to undergo spontaneous cure. Temporary relief, or permanent relief so long as the belt is worn, would be the result of relief of the spasm, which is not followed by spontaneous cure of the cause. It might be also due to relieving ligaments of undue “strain,” which, in the absence of support, is the origin of the symptoms. A third alternative is that undue pressure between opposing surfaces has been relieved by support. This, of course, would particularly apply to the relief of those patients in whom the tilting of the sacrum has passed the normal limits, with the result that there is definite “strain” on the ligaments which connect the bone to the ilia and to the last lumbar vertebra. Failure, of course, can only mean that neither spasm nor “strain” has been relieved. Occasionally a belt increases the symptoms. This can only mean that its application either increases the tendency to “locking” or “displacement,” and therefore increases the spasm ; or it tends to add strain to the already overtaxed ligaments.

The same results follow manipulation. Spontaneous cure

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can only indicate relief of the "locking" or reduction of "displacement." Temporary relief would imply that the same occurs, but that the cause of the symptoms returns. Failure can only mean that the cause has not been remedied, and increase of symptoms that it has been aggravated. This might well happen if joints which are in a condition of acute inflammation, as, for instance, in acute osteo-arthritis, are manipulated. These reflections can be summarised as follows:—When symptoms appear to arise from some lesion connected with the lower part of the back:—

- (i.) If there is any inflammation in the joints a belt should relieve, and, by enforcing a considerable degree of rest, should ultimately cure. Manipulation would augment the trouble.
- (ii.) A case of strain would benefit by the use of a belt and not by manipulation.
- (iii.) Mild cases of "locking" or "displacement" would probably do well with either treatment, though manipulation would be the more rational and scientific.
- (iv.) Severe cases of this type would yield only to manipulation, and might well become worse with the application of a belt. After manipulation the use of a belt might act as a prophylactic measure.

X-ray examination should enable us to secure some help in forming a decision. Osteophytic outgrowths would indicate disease, and would caution us not to expect too much from manipulation, and, at the same time, would warn us to proceed with caution. The belt would then be our chief ally in securing relief; and, if it does not suffice, manipulation, cautiously administered, might be tried as an auxiliary.

If the articular processes seem to be of a different contour on the two sides of a lumbar vertebra, manipulation could be given a first trial. If relief followed, an early return of symptoms would indicate the prophylactic use of a belt. Otherwise, no further treatment is necessary.

If it is plain that the sacrum is unduly tilted backwards, a belt which secures it from any further tendency to backward rotation would probably prove efficacious rather than manipulation; if there is no undue tilting, there is no reason to suspect

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“strain” in the absence of injury, and manipulation seems to offer a better chance of relief.

Trouble arises sometimes in cases when X-ray examination reveals that one side of the last lumbar vertebra has become fused to the sacrum. Support would then be indicated in preference to manipulation. The same applies when the last lumbar transverse processes are so long that they impinge upon the ilium on either side. There may be a bursa or even an actual joint at the point of contact. The bony formation of the lower part of the spine varies within such wide limits in people who present no symptoms of “strain” or “locking,” that X-ray examination must be regarded as confirmatory rather than as diagnostic.

There is, therefore, a place for both treatments in cases of lower back trouble: the choice may be doubtful, but, so far as reflection and superficial observation allow, I have tried to indicate the factors which should probably regulate the decision between them. Combined treatment may also be indicated. The types of case which seem to be chiefly benefited by treatment—support or manipulative—are those presenting pain in the lumbo-sacral region and referred pain down the leg in any position. Dr. William S. Baer reports<sup>1</sup> that evidence of sacro-iliac “strain” is to be found in pain over a spot “just to the side of, and just below, the umbilicus,” and considers that the position, when on the right side, is so close to McBurney’s point that many operations for appendicitis have been performed in error. On the left side the tenderness might well be held to indicate inflammation or engorgement in the neighbourhood of the ovary. This “point” applies to sacro-iliac trouble only, and does not apparently indicate any defect in the lumbo-sacral region.

In attempting to distinguish between fibrositis and neuritis (other than pressure or referred neuritis) of the sciatic nerve, I think there should be definite indications. If the pain is due to “strain,” “locking,” or to “subluxation,” there should be some definite distinction between the resistance in the muscles to be felt on the two sides of the lower part of the back; and, from the side on which the resistance is greater, there would

<sup>1</sup> See report in the *Lancet*, September 29th, 1917, of an article in the Bulletin of the Johns Hopkins Hospital.

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therefore be unusual deviation. These variations from the normal will probably be found to be so trivial that only the closest and most practised observation will detect them. A fair guess should always be possible when observing a patient whose sacrum is unduly tilted backwards, as the lumbar curve would then be unduly pronounced in a forward direction. Very sudden onset of acute pain while making any unusual movement or effort is also suggestive; and, if this history is recent, should incline us to treatment by manipulation rather than by support. When, however, the pain starts as a dull, nagging ache which gets steadily and progressively worse, support is indicated either with or without manipulation as an auxiliary.

The history in any case of the type under discussion is of great importance. The patient who experiences acute pain in the lower part of the back when cranking a car, for instance, may be suspected of "strain" or "locking"; but when it follows lying on damp grass, myalgia, myositis or fibrositis—*i.e.*, lumbago—should be given preferential consideration. In a true sciatica the pain should be limited to the course of the nerve, even when the cause of the irritation is fibrositis in the gluteal region. In cases of sciatic pain referred from the sacro-iliac or lumbo-sacral region other nerves are almost sure to be affected.

How far various other evils are attributable to the "strains" or "lockings" I cannot judge. The evidence, as I encountered it, was so confusing and conflicting that it was impossible to form any opinion. Two points, however, are worthy of notice. The wearing of high heels must tend to increase the forward lumbar curve, and this must tend to the carrying of the sacrum in a position inclined unduly backwards. Although "strain" or "locking" may be insufficient to cause acute pain in the back or leg, it may, nevertheless, be sufficient to account for the "dull back-ache" so often mentioned, and possibly also for many of the abdominal pains commonly referred to the ovarian region. Lowering the heels and support, with or without manipulation, is, of course, worthy of trial.

I have nothing very much to guide me in my observations of "lesions" in other parts of the spinal column till we come to the thoracic region. I was put in receipt of indisputable evidence

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that chronic, irritating cough (in the absence of physical signs in the chest) can yield spontaneously to manipulation. I regard this observation as of great importance. The question of the occurrence of "strain" has not been raised, so far as I know, above the level of the fourth lumbar vertebra; so, in the region we are now considering, the "lesion" should consist of "locking" or "displacement." If either condition really exists, and if either can produce cough by reflex—as was proved to me in a manner I cannot fail to accept—then it is impossible to refuse to accept the conception that similar lesions in the lumbar and sacral regions might produce abdominal symptoms by reflex. One of the evils very commonly attributed to lumbo-sacral "lesion" is constipation. In Sweden, sacral beating is reputed to act beneficially; in America, the same claim is made by the chiropractors for percussion of the spine and by the osteopaths for manipulation. It is not impossible that the teaching of all three schools may be of service, and that each method of treatment advocated acts in the same way, namely, by relieving some "locking" or "displacement."

In the cervical region manipulation has succeeded in curing many forms of chronic headache, and particularly in the occipital region; and several patients spoke of relief of what almost amounted to migraine attacks. There is another claim which is made for manipulation of the cervical region and which, in view of the relief unquestionably rendered in the lower part of the spine, cannot be dismissed without consideration. This is the assistance rendered in cases of brachial neuritis. I happened to see only one patient, so far as I can recall, who had sought relief from this treatment, and she found it. I should regard this evidence, taken alone, as negligible; but, when taken in conjunction with the relief frequently secured from manipulation of the lumbar spine, it cannot be ignored.

But, equally, neither is it possible to ignore the effect of posture. Dr. Joel E. Goldthwait has expended endless trouble in his attempt to prove to his professional brethren the value of insisting on the restoration of the proper carriage of the body in the erect position. Unfortunately there are many who have failed to listen. No treatment can relieve a brachial neuritis,

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which is due to pressure owing to incorrect posture, except the correction of the defect.<sup>1</sup> Indeed, nothing in my whole visit impressed me more than the careful attention he has paid to postural treatment. The testimony of his countless patients is evidence of its value. The variety of lesions he has relieved in this way is very great; and, though I had thought previously that I had attributed sufficient importance to the study of posture, he has taught me that I have failed to do so up to the present. Of this I am convinced: no manipulation and no support will ever do more than give temporary and partial relief unless postural treatment receives the attention it deserves.

I cannot pass over one observation that has filled me with amazement for several years. Perhaps it is an example of folklore which, in the light of recent experiences, has gained an importance which I had not formerly attributed to it. There is a custom, among many different classes of manual workers, to fasten up their nether garments with a leather strap-belt, while the trousers are suspended in the usual way by braces. Care is often taken to thread the braces through the loops attached to the top of the drawers. The belt is always of a pattern which gives a strength and stability out of all proportion to the work done if its object is merely to support clothing. Equally it is applied with a firmness and vigour which is quite unnecessary if this is the sole function of the belt. So far as I know, the custom is confined to men whose work is very laborious. Is it not possible that this custom has, in reality, some hidden meaning? It seems such a senseless procedure otherwise, and would not be confined to such a narrow circle of the community. It would seem not improbable that the custom arose in the past owing to an instinctive desire for support to the sacro-iliac region during the periods of severe strain.

More doubt and indecision is left in my mind when I reconsider my investigations into the condition known as *sub-deltoid bursitis* even than when considering sacro-iliac "strain." One

<sup>1</sup> See "Some Points of Contact between Neurology and Orthopædic Surgery" (*Journal of American Medical Association*, September 11th, 1909).

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surgeon recognised the lesion I intended to describe by this name, but informed me that the chief difficulty was that it was not "sub-deltoid" and was not a "bursitis." He was not alone in expressing this view. In fact, I am of opinion that the diagnosis covers a variety of definite lesions, which, in this country, we group together under the generic term of "arthritis" of the shoulder.

In one school I received assurance that "sub-deltoid bursitis" was due to tearing of the periosteum at the insertion of the supraspinatus. I was shown radiographs in support of this contention, in which could plainly be seen an unusual bony prominence at the spot indicated.

In the second school I was shown photos in which shadows had been thrown by what were apparently calcareous nodules in the sub-deltoid bursa, and the claim was made that a true sub-deltoid bursitis was the cause of the symptoms. In a third school it was held that, at operation, it had been demonstrated that so-called "sub-deltoid bursitis" was due to a tearing away of the subscapularis from the capsule of the shoulder-joint. Another school tends to ignore the very existence of the lesion, and classes all conditions which might be known by this name as manifestations of monarticular osteo-arthritis.

Those who hold the first three views are, however, unanimous in considering the various conditions as very disabling and very difficult to treat. They were all equally pessimistic as regards prognosis, and all expressed doubt as to the possibility of ultimate restoration. One patient particularly interested me. He is now a well-known surgeon in New York, and the son of a medical man. When at college he was a first-class pitcher at baseball. He pitched in three important matches in close succession. During the third match he "felt something snap in his shoulder," was completely disabled for a considerable time, and, in spite of frequent attempts, has never been able to pitch over-hand again, though he succeeded in "making some sort of show round-arm."

The boy, wearying of his tedious convalescence, was taken by his father to see a large number of experts, amongst them a surgeon of wide international fame. All failed to hasten his recovery. In despair, he succeeded in persuading his father to

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allow him to visit a famous bone-setter in Ohio. This irregular practitioner owned at once that this was a type of case for which he could do nothing and—this was many years ago—gave most interesting advice:—To go home, to lie flat on the bed several times a day, to move the hand out across the bed away from the side as far as it would go without pain and then to return it to the side. He promised, as a result of perseverance, that the range of movement would gradually increase until full movement was restored. He also cautioned the patient that, if he tried to force progress to an extent that caused pain, he would never recover; and that, at best, he would never be able to pitch again, even though movement might be perfect. This prophecy was fulfilled in all detail.

The usual prescription is hot-air baths, complete rest for varying periods, and thereafter the patient is left to work out his own salvation—advice usually unsatisfactory to the patient and barren in result. When the value of graduated faradic contraction in the treatment of muscles is duly appreciated in America, I cannot help thinking that cases of "sub-deltoid bursitis" will be offered a more favourable prognosis.

This appears to me to be certain. There are three definite conditions all grouped together under this name. There is partial rupture of the tendon of the supraspinatus, there is injury (probably partial rupture) of the subscapularis, and there is a true sub-deltoid bursitis.

The latter is probably encountered whenever symptoms follow a "toss" on to the shoulder. Treatment should be by radiant heat baths, followed by exercises as already indicated for training a weak deltoid. The old bone-setter's advice could not be bettered.

It should be possible to distinguish between this condition and those due to injury to the subscapularis and supraspinatus. Creaking will probably be felt on palpation during active or passive movements of the shoulder in all these cases; but the situation of the pain on active contraction of the injured muscles should sufficiently indicate the nature of the injury when these are affected. Treatment should follow similar lines, but the addition of graduated faradic contraction to the supraspinatus should render recovery complete.

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Muscle training of the rotators should also prove a valuable auxiliary in treatment. The fact that callus may be thrown out at the insertion of a muscle should warn us not to attempt to "push" treatment, but to regard scrupulously the laws drawn up for the treatment of all recent injury.

One reflection is of interest. It would seem probable that the pain and disability which follow fracture of the greater tuberosity of the humerus are largely due to the intensity of the sub-deltoid bursitis, which is almost inevitably haemorrhagic. This would account for the otherwise inexplicable increase to be noted in both symptoms, when comparing a case of uncomplicated fracture of the surgical neck of the humerus with one in which similar injury is complicated by separation of the greater tuberosity.

The above expression of opinion was written on the boat during my return home. Since then I have taken every opportunity of testing my theories, with the following results.

A dressmaker and a gymnast both came to hospital complaining of the sudden onset of acute "lumbago," the first while working in a cramped position, the second while doing gymnastic work. Neither gave any history of previous trouble. Attempts to secure rotation of the ilium effected rapid and complete relief in both cases. I use the word "attempts," because I could not detect any movement of the ilium on the sacrum at the time of manipulation.

I have fitted a large number of belts of the Goldthwait pattern to patients complaining of "muscular rheumatism," of "lumbago," and of "sciatica"—all of long standing, and all of whom had received every variety of treatment without avail. Manipulation in these chronic cases has so far failed me. The result has been varied, as was to be expected from the heterogeneous type of material. In a vast majority of cases relief has been marked, and several patients have returned to work—two to laborious work, I believe—after months and even years of incapacity. In two cases at least no benefit has been noted, and others are as yet *sub judice*. I have seen enough, however, to assert confidently that sacro-iliac strain does exist and that relief can be afforded by the fitting of proper support. This should, as a rule, tend to draw the two anterior superior

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spines together and to press backwards towards the sacrum that on the painful side.

I have attempted manipulation of the cervical spine with almost dramatic success in two cases of "brachial neuritis," with marked success in two cases of "migraine," and with varied success in several other cases. Complete failure has also to be recorded; but so far, in the cases I have treated, amelioration has been the rule. Both "migraine" cases were of interest. One was an officer with apparently typical attacks at frequent intervals, each attack ending in intense headache for two days. When I last heard of him the attacks had ceased. The other patient was hit by a bullet in May, 1915, which broke his jaw, travelled round and came out over the root of the neck. From that time to December, 1919, the patient had been completely incapacitated owing to the fact that on any sudden movement or on stooping he suffered intense pain (apparently in his great occipital nerve) which "bowled him over," faint and nauseated. He is now (April, 1920) about to return to work as a French polisher.

I have attempted manipulation of the thoracic spine for patients with chronic cough in three cases. One was a "dead failure." The second, an elderly woman of sixty-seven, had suffered from intense spasms of coughing for "five or six years." I gave a very complete examination, testing thoroughly all movements in the spine, and perhaps this amounted to manipulation. To my intense surprise I received a letter some time later saying: "I have had no recurrence of my terrible paroxysms of coughing, for which I am most thankful and grateful." I am sorry to say the patient is apparently relapsing, but I have had no chance of attempting a second manipulation, as she lives too far away. This case tempted me to try to help a young girl who is training for operatic singing. Her mistress was "in despair," so the student said. After two manipulations she was "able to sing better than for months," and her mistress sent most grateful messages. I have not the least doubt that this percentage of success will not be maintained; but the evidence is probably enough to indicate that the claims made to relieve chronic spasmodic cough by manipulation are not to be put aside too lightly. I did all in my power to

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exclude all psychical effect, but it is impossible to say how far this has operated.

I have only seen one case which I think was typical of "sub-deltoid bursitis." I built up a very wasted supraspinatus with graduated faradic contraction and then manipulated once under gas. Very great improvement is reported, and I am hoping to hear of complete cure.

On the whole, four months' experience has tended to confirm the accuracy of most of the conclusions expressed above. At least this much is certain: an attempt should be made to relieve by manipulation, "lumbago" and "sciatic pains" which start suddenly as the result of cramped position or strain. A typical sciatica and lumbago of long standing should be given treatment by support, and many cases will be relieved. Neck manipulation in obscure cases of pain in the head, neck and upper extremity is worthy of a trial.

## CHAPTER XXVI.

### THE TREATMENT OF CONSTITUTIONAL DISORDERS.

THE symptoms which massage treatment is called upon to relieve, when dealing with general constitutional disorders, are those arising from toxicity, whether this be due to sepsis, rheumatism, or to the accumulation of waste products within the body.

*Lumbago* may be taken as typical of all myalgias. Massage treatment can frequently abort an attack, and can usually cure one when fully established. It cannot prevent repetition. Nothing can do this except the removal of the cause, which may entail appendicectomy, extraction of all the teeth, the cure of constipation, or proper regulation of diet and exercise. Sometimes the attack is a pure rheumatic symptom. Similar symptoms may be due to causes referred to in the previous chapter, where appropriate treatment was considered.

By some means or another the patient must be rolled on to the face—a very painful proceeding in an acute case, though the return journey may be a very simple matter. In the so-called "rheumatic" lumbago the cause of the pain is unknown; but, judging from the effects of treatment, we can only conclude that some deposit has been formed in the deep structures of the back, and that the nerves which pass through them are thereby involved. It is possible that the muscles collect waste products within themselves, and that the pain originates in pressure on the sensory nerves in the muscles.

Whatever the cause, treatment is simple and effective. Surface stroking is followed in three or four minutes by ever-increasing depth of stroking from the region of the sacrum to the upper dorsal region. The hands should work on either side of the spinous processes. The whole erector spinae should then be lateralised by stroking with the ball of the thumb along the edge of the processes so as to push the muscle mass away

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from them. Then the movement should be repeated from the outer border of the muscle, the pressure being directed towards the spine. Deep kneading should follow, beginning over the mid-dorsal region and working upwards. The lower dorsal region is next treated, then the upper again, and slowly each successive segment is attacked right down to the sacrum. Before starting to treat a new segment, all the area above should be dealt with anew, either by kneading or by deep stroking.

Dry cupping is a very favourite remedy. The technique is simple : all the apparatus required is a Bier's cupping glass of



FIG. 148.—To show "dry cupping" of the back by massage.

about 2 inches diameter and plenty of vaseline. The latter is spread *thickly* over the area to be treated and the cup is then applied. The skin is drawn up into the cup by the suction and the treatment begins. The glass cup is pulled directly away from the surface, care being taken not to elevate or depress any one part of the circumference of the glass. Not only is the skin under the cup thus elevated, but also all the surrounding area. The cup is then pushed to and fro over the surface, the upward traction being maintained and the circumference of the cup being kept flat. At times air will leak in and the cup become detached. It is then replaced, and the process is renewed till the whole surface is a uniform pink colour. At the start the

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cup will become detached whenever a bony prominence is approached ; as treatment continues this liability lessens, till finally it is usual to be able to pass the cup right over most of the bony prominences. The skin should show no sign of bruising next day. Occasionally, especially if sepsis has been present, cupping is liable to produce a pustular rash. It should then be discontinued.

In China a similar process is performed by the hands as a special movement of massage. The skin and subcutaneous tissues are gripped between the middle phalanges of the first and second fingers, and they are then elevated as far as possible (see Fig. 148). It is a useful movement and may be freely administered as soon as the pain is subsiding.

Throughout treatment care must be taken that no manipulation is performed that increases the pain. Anything that tends to do so should be postponed, and one of the earlier movements must be persevered with until the deeper movements can be tolerated with impunity. The *séance* should not be unduly prolonged, about half an hour being fully adequate. The deeper movements especially must not be continued for more than a few minutes over any one spot. The aim of treatment is to hasten the onflow of the lymph and of the venous circulation, and to ensure that the arterioles are toned up. Prolonged treatment may defeat the object by producing a paralytic dilatation. The *séance* should terminate with stroking.

In a chronic case of some standing, percussion may be essential to secure relief. Deep vibrations are probably more effective than any other form. Local areas of tenderness or thickening should be treated by frictions.

Not infrequently, and particularly in gouty subjects, definite deposits can be felt in the tissues. These may consist of "nests of crystals." One such "nest" has been examined. Dr. F. Radcliffe reports the result in the *Lancet*, p. 103, 1918 : "The material was found to consist of a mass of fat-cells lying in a coarse stroma of connective tissue, fibrin and some elastic tissue. No crystals were found." Yet previously, at operation, "crystal-like" structures had been distinctly felt, and these "disappeared" within two minutes of being placed upon the slide. He asks : "Were these crystals volatile ?" and

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there is little doubt they were. For our present purpose this speculation is unimportant ; the point is that definite pathological nodules do exist and that they cause intense pain. It is certain, too, that much can be done by frictions to cause them to disappear. Dr. Radcliffe's account of the technique used is so identical with my own that I merely quote from the above article. " After some weeks of constant practice," he says, " I was able myself to localise the tender areas," thus showing the necessity of cultivating the sense of touch in a very specialised way before attempting to undertake treatment. He continues :—

" I would lay stress on the importance of massage being properly applied. The ordinary so-called massage does not, as a rule, have the slightest effect on these deposits. Quite a large number of our patients have been treated by hydro-therapy and massage for weeks or months at other centres without satisfactory results. The form of massage has been the ordinary kind extended over the whole limb or limbs without concentration on the affected tendon or muscle. We find that after a period of three to four weeks' treatment by hydro-therapy and massage, consisting of deep thumbing movements on these areas, followed by deep kneading and upward pressure, the deposits, which can be felt to break up, have disappeared and the pain has vanished. A great saving of time and labour is effected, for the whole limb need not be massaged until the end of the daily process, when the clearing away of the effete products is desired."

I would only add that the frictions should begin very gently, and, as tolerance increases, may become steadily firmer. The presence of nodular thickenings can sometimes be detected more easily if oil is applied to the patient's skin, but its presence is a hindrance rather than an assistance to the performance of the massage.

Captain T. Marlin has treated several cases for me by galvanism, and the result has sometimes been most gratifying. The skin is tested for sensitive " spots " by Faradism. A round needle, attached to a negative pole, is inserted into the spot, and success in selection of the exact spot is held to be proved by reproduction of the pain of which the patient complains.

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A current of five milliampères is then passed through the needle for three to six minutes. The pain gets less during treatment, but may increase after three to four hours' time. The test of success is that the patient should sleep better after the treatment. My experience of the treatment, which is very unpleasant, is so limited that I cannot say how frequently it may be necessary or in what cases it should be applied. My impression is that it is not likely to develop into routine treatment.

Other muscles may be affected in the same way, the commonest being the muscles of the neck. The origin of an attack of *stiff-neck* ("rheumatic" torticollis) can nearly always be traced either to damp or cold. It may be presumed that the cause is rheumatic. Treatment should follow on the lines suggested above, but the stroking should be performed from above downwards, while kneading should begin near the root of the neck and slowly work upwards.

*Pleurodynia*, perhaps the most common of the acute forms of *myalgia*, consists of excruciating pain in the intercostal muscles. Much can be done to relieve it by massage, but we have to rely chiefly on kneading and friction. Stroking should however, precede and succeed these movements.

Any other muscles may be affected, those of the head and of the shoulder regions furnishing examples. Treatment must be conducted on lines similar to those sketched out above.

In all cases of *myalgia* we are justified in assuming toxicity. If this is true, the more we can assist the elimination of waste products the better. Local treatment may therefore be followed by a short general massage of the four limbs, and abdominal massage and exercises should be considered.

A condition closely allied to *myalgia* is found in the *fasciæ*—*a fibrositis*. Presumably the two conditions are often present simultaneously and differentiation between them is impossible. Fibrositis is often accompanied by obesity. The cause is probably the deposit of toxic material in the lymph spaces lining the facial planes. Treatment should be carried out as described for cases of lumbago in its various stages—acute, sub-acute, or chronic.

*Obesity* can sometimes be treated most successfully by

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massage, but caution should be exercised in applying the treatment. One rare form of obesity is accompanied by pain in the areas where the fat is about to be deposited, and, in massage, we have an agency by which the pain can be materially eased.

There are four main classes of obesity. It may be hereditary, when the undue deposit has no effect on the general health, and therefore the aid of massage will not be invoked.

In children it is usually due to concurrent disease, such as anæmia and rickets, which must receive appropriate attention.

Women about the time of the change of life frequently "put on flesh" at an alarming pace. As a rule, the administration of thyroid extract is a more scientifically correct treatment than the application of massage ; but, if the patient's health is being affected deleteriously by the deposit, massage can afford material assistance in treatment.

The fourth type of case is the one that usually calls for massage treatment. This may be described as the "gouty" type. It may occur in many different ways, but, roughly speaking, cause and effect may be summed up by stating that injudicious or excessive feeding introduces into the body an amount of nourishment in excess of that required for the expenditure of energy. The excess is the cause of the fatty deposit. This condition is usually encountered in people over forty years of age, and may be very serious and disabling. Two classes of case are commonly met with—the chronic overfeeder ; and the man who suddenly alters his habit of life, without altering his dietary to correspond with the decrease in exercise.

The utmost care must be taken to discriminate between two main groups of cases—namely, that in which the vital actions (heart and respiration) are unimpaired, when the patient is frequently said to be suffering from fatty infiltration of the heart ; and that in which either or both have suffered, perhaps severely, and the diagnosis is fatty degeneration of the heart. To contrast the treatment, it may be said that exercise for the latter may be fatal ; for the former it may suffice to cure.

The toxic (or gouty) form, in which the vital functions have not suffered, may be remedied by massage, and the main

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objective in treatment should be to assist the vascular system, particular attention being paid to the portal circulation.<sup>1</sup> Gentle, rhythmical kneading, combined with deep stroking, should be applied to the four limbs, and general abdominal massage should follow. Breathing exercises—the simpler the better—complete the *séance*. As “tone” returns a gradually increasing amount of exercise may be prescribed. The importance of breathing exercises will be better realised when we consider that it is not uncommon to find, *post-mortem*, that unduly stout subjects often have a comparatively small lung capacity, while in thin subjects it is comparatively large.

Though massage may render valuable assistance to these sufferers, it can in no way compete with exercise as a remedial agent, since the cause of the condition is chiefly lack of it. But, usually owing to heart involvement, the victim is unable to indulge in the natural cure, and so artificial means are necessary. Much as massage may assist, the benefit is bestowed far more rapidly and efficiently by the use of general rhythmical faradisation on the Bergonié chair. By this means every muscle in the body can be exercised freely, not only without straining the heart, but while actually saving it from labour. As Sir Lauder Brunton has said, “at each relaxation of a muscle it tends to cause a vacuum within its surrounding fascia, into which the lymph flows from the muscular structures. At each contraction the muscle presses lymph out, and these alternate muscular movements really act as a subsidiary heart.” By use of the chair every muscle in the body is thus transformed into a “subsidiary heart,” and that, too, without involving any strain, or even effort, on the part of the nervous system. Sometimes patients actually fall asleep under treatment. Local troubles, such as fibrositis, which may co-exist with the obesity, call for additional treatment by massage.

For the non-toxic type of obesity the Bergonié chair is practically useless, whereas massage may often be of great service. To be effective the treatment must be thorough. An old-fashioned remedy for the undue deposit of fat about the hips of women—almost in itself a separate type of obesity—is

<sup>1</sup> The technique of applying massage to assist the portal circulation is described in the next chapter (see p. 395).

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to roll on the bare floor night and morning for a few minutes. Several patients have borne witness to the efficacy of the remedy. The problem is to transfer the fat globules to the lymph channels, and to effect this end some form of emulsification has to be performed. In some positions, such as under the chin, rolling between finger and thumb will prove efficacious. On the abdomen, picking up of the whole of the subcutaneous tissues of the abdominal wall will prove satisfactory, while elsewhere a combination of this and of kneading will prove to be the best technique. General abdominal massage should be included, though it is not so essentially a part of treatment as in the toxic variety. All treatment must be vigorous.

Almost every patient who is under treatment for obesity has been put on a strict diet by the medical man. The masseur should have nothing whatever to do with this part of the treatment, except to report if he has reason to believe that the prescription is not strictly observed.

A well-known *mot* runs that "no man need have the gout who can afford to keep a slave," and doubtless it is true as regards the acute attacks that follow gross errors of dietary—if the "slave" be an expert masseur. Though regarded with levity by that portion of the public which does not suffer from it, this horrible complaint is not only a cause of acute suffering or intense discomfort, but also may lead to permanent crippling and even hasten the approach of death. Let us remember, too, that, though many patients have brought the curse upon themselves, there are many others who suffer as the victims of circumstances. Osler states that hereditary influences can be traced in 50 per cent. to 60 per cent. of all cases. In addition to joint changes, the patient usually suffers from chronic nephritis, arterio-sclerosis is common, and the heart is often hypertrophied. Emphysema is frequent in old-standing cases.

Whether obesity is present or not, treatment should be administered in the same manner as was advocated for that of the toxic variety of the complaint. The nodular points, which called for frictions, are here replaced by the deposits around the joints in chronic cases. In acute cases the whole of the area

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of inflammation should, of course, be given a wide berth. With this reservation massage is not only permissible, it is appropriate. General massage (especially abdominal) should open the *séance*, the limb containing the inflamed joint being left till the last. Supposing, as is usual, that the great-toe joint is affected, the whole limb should receive a dose of surface stroking from the mid-tibial region to the hip. Deep stroking is gradually substituted, and then the thigh should be kneaded gently. Stroking terminates the *séance*, which should have afforded the greatest possible relief to the sufferer, if technique has been efficient. The attack over, the patient should be given a table of exercises to be used as a prophylactic. The tendency to emphysema renders it necessary that respiratory exercises should take a prominent part, and the cardiac hypertrophy warns us to begin cautiously, increase gradually, and at all times to avoid strain. It is probable that regular doses of massage, or of Bergonié treatment, can serve as a permanent prophylactic against acute attacks, and that either can retard the progress of the disease and of its co-incident evils. It is thus possible, by ensuring the more efficient elimination of urates, that even life itself may be prolonged for "gouty" patients.

At the present time *osteo-arthritis* is usually an incurable disease. The cause is unknown, but doubtless it owes its origin to chronic poisoning. This may be from some local focus, such as pyorrhœa alveolaris or chronic constipation; or it may be due to the lack of something in the organism which controls the metabolism of the body. On this subject little is known, but thyroid insufficiency appears to be a possible cause of the trouble, since adequate treatment by adding the extract of the gland to the dietary often seems to alleviate, if not to cure, the disease.

It has been said, with some degree of truth, that victims of *osteo-arthritis* rarely suffer from other ills, unless indeed the disease can be traced to some definite cause. The disease, once the acute stage is over, is liable to become chronic in character and usually very prolonged. The pain in the swollen joints is often very acute, and they are therefore held rigidly in the

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position of maximum comfort. The result, only too often, is the formation of contractures.

When massage is invoked there should be several aims in view. First, the presumption is that some general toxic condition calls for remedy. General massage, particularly to assist the portal circulation, should therefore be given. Second, the possible cause should be sought for diligently, and everything that can possibly be done to assist in remedying any abnormality of function should be carried out. Thus constipation or indigestion should receive appropriate treatment. Third, every effort should be made to prevent the occurrence of contractures, as, once they are present, little can be done to remedy the defect without operation, the result of which is frequently disappointing. Mobilisation in all its forms should therefore be an essential part of treatment. Fourth, mobility should be restored with all possible celerity at all joints, for the very fact that one joint is maintained in a state of rigidity necessarily entails lack of mobility in neighbouring joints. If we accept the axiom that "movement is life," the reduction of movement in a normal joint may be presumed to lower its vitality, and thus it would be more liable to fall a victim to the disease. Fifth, much can be done to prevent the stiffening of the affected joints, and this may save the patient the very painful remedy of movement under an anaesthetic. Careful administration of relaxed movement is the best remedy at our disposal. Sixth, the evils consequent on enforced lack of exercise should be guarded against, and every effort should be made to maintain the nutrition of the muscles and to assist elimination of waste products. Seventh, and last, the psychical aspect of the case must never be disregarded, as the victims of this painful, crippling, and often incurable disease need all the moral and psychical support that can be lavished upon them.

As with most other ailments, the disease may be acute, sub-acute, or chronic. Also it may be mono-articular or general. The former can frequently be traced to some definite injury. Often enough, particularly in women after the menopause, both knees become affected as the first evidence of the onset of the polyarticular variety. The progress of the disease to the other large joints may be very slow. In another type of

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case the small joints of hands and feet are affected while the large joints apparently escape. Finally, there are cases in which the onset is acute and general, and the attack is often confused with rheumatic fever. The most terrible form of the disease is that which affects the joints of the spine (spondylitis deformans).

Treatment for the true mono-articular variety is very easily dismissed, though the results are not always gratifying. Massage of the whole limb should be given to assist the general circulation and local treatment to assist the nutrition of the wasted muscles. All the muscles which control the movement of the joint should receive attention, even though all are not wasted alike. Relaxed movement should be administered during the continuance of the massage, and, if the trouble is chronic, assistive movements should be given, and active movements prescribed as regular courses. Both should be begun tentatively, and progress should be graduated with care. Faradism will prove invaluable in restoring the strength of the wasted muscles. Bier's congestion treatment, the *eau courante*, and radiant heat baths all form valuable adjuvants.

Treatment of a similar character may be given to the poly-articular variety of the disease during its chronic stages. If the patient's activities are reduced, the treatment in all its forms should be general, special attention being paid to the abdomen. No matter how advanced the disease may be when we are asked to help—the patient may have only a bed-ridden caricature of a human body—still the treatment must be carried out in the same way with all patience and never-ceasing care. However hopeless to all appearance, no deformity can be so extreme but that it will become worse if left to run its course, while material improvement can usually be secured. The lightest stroking may be unbearable over certain points at first, and movement may be impossible. Treatment should be guided by the law so often quoted—any point that is tender or hypersensitive is the last that should receive attention. Similarly, any joint that is sensitive should have its dose of mobilisation postponed until the other joints have had their exercise. By their recovery of mobility it may be possible to restore some degree of vitality even to the most hopeless joint,

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though restoration of mobility will be regulated by the amount of bony deformity and of muscular contracture. It is well to remember that, in cases of marked osteo-arthritis of the joints of the foot, increase of mobility sometimes leads to increase of pain. A rigid painless foot is of more service than one that is mobile and painful. In very mild cases manipulation may relieve symptoms.

It is almost impossible that manipulations should be painless, but the pain should be limited to what many patients refer to as a "pleasant ache" or a "nice pain." Should severe pain be caused inadvertently, it can usually be relieved by stroking.

Great care should be taken to regard in treatment the law that deals with the signs of excess. Any decrease in movement, or increase of pain or swelling, as compared with the condition present on the previous day should indicate that treatment must be reduced. The treatment may not have been excessive the day before, as the disease is liable to wave-like variations ; but treatment that may be beneficial one day might well prove harmful the next, if some slight exacerbation has taken place during the night.

During the acute phases the utmost care must be exercised ; massage should be of the lightest and should aim solely at relieving pain, while mobilisation should be left for a future date. As the attack subsides much benefit can be derived from cautious local kneading of the periarticular structures. Voluntary exercise of all muscles, as occasion allows, is an essential part of all treatment.

Few physicians seem to realise the fact that massage may be invaluable in the treatment of cases of *diabetes*. Most will recognise that treatment at Aix-les-Bains is powerful for good ; but after all, when there, the chief remedial agent is massage. The local water is utilised as a lubricant, it is true, but, as Graham writes, "this is simply another illustration that every substance capable of being rubbed on the human body has had wonderful virtues ascribed to it, and it must be that which is common to them all that does the good—namely, the rubbing." This has been echoed, when writing on another subject, by Sir

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William Bennett, who says : " You may use liniments or not as you like : it is the rubbing that does the good."

It has been proved over and over again that massage has a potent effect on the elimination of waste products. General massage should therefore be administered to the diabetic, particular attention being given to the abdomen, with the idea of assisting the portal circulation.

Diabetic neuritis may be greatly benefited by massage, the pain or numbness relieved, and the irritation or tingling kept in abeyance. If all that massage could effect was alleviation of the torture of the irritation, its administration would be invaluable.

It may be too much to say that massage can permanently prevent the onset of diabetic gangrene ; certainly it can postpone it for a very long period of time. Moreover, it can prevent or limit its spread when once established, and can hasten the healing of ulcers on the feet which, without its aid, would never heal. Prevention being better than cure, massage should always be given to assist the circulation in the lower limbs whenever its aid is invoked in the treatment of diabetes. The fact that gangrene is liable to occur should suffice to indicate the care and caution that should be exercised. Deep stroking must be performed with delicacy of touch, and kneading or picking-up should be of the gentlest possible character.

*Senile gangrene*, probably a symptom of arterio-sclerosis, may be dealt with in a similar manner. As a prophylactic, the use of massage has proved to be most encouraging.

In the treatment of *rickets* we have to deal with another general disorder of metabolism. It is a disease of the first and second years of life, though occasionally so-called "adult rickets" may develop at about the time of puberty.

The disease is due to faulty nutrition, and may have lasting effects. The child may be lean and "scraggy," or fat and flabby. There is fretfulness, slight fever, and sweating at night. The mother often reports that "baby is tender all over."

The lightest possible stroking over the whole body with warm oil will do much to relieve the sensitiveness, especially if the

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child is of the "scraggy" type. The liver is usually enlarged and the abdomen distended by this and by flatulence. The child is therefore "pot-bellied," and abdominal massage very delicately performed, should be practised. The legs tend to bow, and so soft is the bone that much may be done to mould them into shape by manipulation during the performance of massage. No attempt should be made to hurry the process. The general tenderness that exists will probably ensure that progress is slow, but in any event the moulding should be performed with all possible gentleness.

A long period of time often elapses before the bones become rigid, and so it is possible to do much for the correction of other deformities which are frequently noticed in chest and back. The child will usually be found to have adenoids, and the tonsils will probably be enlarged. As soon as the patient is old enough breathing exercises should be taught. As a rule these should consist of lateral body-bending exercises with rotation, so arranged as to render the compressed lower ribs prominent. Deep breathing is then encouraged, and the child is taught to dilate that part of the base of the lung which has hitherto been prevented from expanding (see Fig. 150, p. 434). Assistance should be given in the form of an attempt to twist the ribs round while the spine remains fixed. Abbot has shown the extraordinary power of the repetition of the respiratory movements in moulding the chest wall, when the movements are properly directed. Stated shortly, the principle underlying his treatment for scoliosis is to place the patient in a plaster jacket, which is so arranged that the prominent part of the chest wall cannot expand while the receding portion, being out of contact with the plaster case, can do so. The incessant movement of this part of the chest wall, and the comparative immobility of that of the opposite side, not only results in alteration of the shape of the ribs, but also corrects the rotation of the vertebrae. But, if the bones are soft from rickets, this plan is dangerous, as it is likely to result in all sorts of moulding in undesirable and unexpected places. It is for these cases that massage, hand moulding, and breathing exercises should be employed. Though plaster cannot be applied, at least the principles underlying the treatment should be employed. Later

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on, when the bones are firm, these means are of small avail, and, if deformity is to be remedied, plaster should be used. The greatest possible care is necessary in its application.

When applying massage to cases of rickets the treatment should be general. Even if there is no apparent deformity of the limbs, these call for treatment so as to ensure their fullest possible nutrition, and to assist in elimination of waste products. Abdominal massage is called for to relieve any tendency to constipation that may exist, and to assist the portal circulation.

The *primary anæmias* are not calculated to derive any great benefit from massage treatment, beyond the fact that it is always possible to add greatly to the patient's sense of well-being by its employment.

In dealing with *secondary anæmias*, however, much benefit may be derived from skilful massage. Graham has epitomised some elaborate investigations by J. K. Mitchell as to the effect of massage on the blood. After treatment there is usually a great increase in the number of red corpuscles, and frequently in hæmoglobin. Moreover, the effect is not transient, as, when the improvement had been noted throughout a course of massage, its cessation did not lead to any return of anæmia. He adds that massage does not create blood-cells, and indicates the manner in which benefit may accrue by quoting from Mitchell, who likened anæmia to "the want of circulating money in times of panic, when gold is hoarded and not made use of, and interference with commerce and manufacturing results."

In all cases of illness it is a little difficult to decide the relationship of cause and effect. In chlorosis there is almost invariably associated a marked degree of constipation. The latter may be the cause of the anæmia ; and certainly it is wise, from the massage point of view, to consider all anæmia cases, that we are called upon to treat, as being toxic in origin. Abdominal massage, to aid the portal circulation and to combat the constipation, should therefore be awarded a prominent place in treatment. Breathing exercises should always be prescribed.

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Some physicians request the masseur to try to reduce oedema of the legs in patients suffering from *chronic nephritis*. It is a hard and often a heart-breaking task, were it not that the patient derives great comfort from proper manipulation. Nothing need be added as regards the local treatment to what has already been said on the treatment of oedema (see p. 18). This is applied for relief of the symptoms and will not assist recovery in any way. Part of the main trouble is probably toxic, and it is well known that general (and particularly abdominal) massage can greatly increase the output of urine, and can also add materially to the percentage of solids excreted in it. The patient with oedematous feet is deprived of exercise, and so the accumulation of waste products proceeds apace. This added toxicity of the blood can only act detrimentally upon the already diseased kidneys. Thus permission to perform abdominal massage should always be sought when called upon to treat a chronic nephritic; but, if it is granted, one danger must be borne in mind. Nearly all these cases have a high blood-pressure, and every care must be taken to avoid causing an excessive or a sudden rise. Otherwise the patient may run the risk of cerebral haemorrhage.

Abdominal treatment must therefore be of short duration and gentle in character, and should aim chiefly at assisting the portal circulation. There is rarely any need to give treatment for constipation, as this is invariably attended to with care by the medical man as a routine part of treatment.

Though not strictly speaking a general constitutional disease, this is probably the most suitable place to refer to the treatment of *Grave's disease* (exophthalmic goitre). From the purely massage point of view we should consider the patient as a victim of neurasthenia combined with a general toxæmia. It is wise to treat all these patients on the lines advocated for the treatment of neurasthenia, with this difference, that general abdominal massage, designed particularly to assist the portal circulation, should always find a prominent place. Treatment should therefore begin with surface stroking of the legs, general abdominal massage follows, and finally the back, arms, and head regions receive their dose of sedative treatment in the

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order named. There may be a temptation to administer local heart treatment. It is probably unwise from the psychological point of view. The patient suffers from tachycardia, and often imagines that the heart is seriously diseased. The physician may have to devote much time to dispelling this dread, and to administer local treatment may well lead to the supposition that his assurances are mere soporifics.

One word of warning is required about massage of the neck in this condition. It must be conscientiously avoided. No pressure whatever must be placed on the gland, as this leads to increased absorption. This is recognised in the operating theatre, where it is well known that the danger to the patient is almost directly proportionate to the extent of manipulation of the gland. It was probably owing to lack of realisation of this fact that so many patients lost their lives in the earlier days of operation for this complaint.

## CHAPTER XXVII.

### MASSAGE TREATMENT FOR DISORDERS OF THE DIGESTIVE SYSTEM.

MANY patients are told to massage their gums ; few are instructed how to do it. The suggestion is usually made when pyorrhœa alveolaris is either present or suspected. There is a dual objective, namely, to empty any pockets of pus that may be present, and so to assist the vascular supply of the gums that infection may be overcome or prevented.

To empty any pockets which may be present, kneading should be employed from the labial attachment towards the edge of the gum. The side of the finger is applied firmly and the pad is then rolled over the gum in the direction indicated. When pus is present the gum will bleed slightly, so we are justified in the assumption that our manipulation will cause a certain amount of absorption. Thus, no doubt, each pressure entails the administration of a mild dose of vaccine. The kneading (which practically amounts to squeezing) should not, therefore, be very vigorous, at least in the earlier stages. It is well to wrap the finger round in a piece of lint dipped in strong peroxide of hydrogen (20 vols. per cent.), which can subsequently be burnt. Care should be exercised in using the lotion, as it tends to destroy anything it touches, and bleaches moustache or beard. The gums should then receive treatment by firm stroking from the mid-line in front to the extreme end behind. Both inner and outer surfaces should be dealt with. The whole *séance* should last about ten minutes. Indiscriminate scrubbing is of comparatively little use.

*Pharyngitis* can frequently be relieved by massage. The relief which can be secured when suffering from a "sore-throat" is considerable. The difficulty in swallowing is diminished, the general feeling of fulness and dryness is improved, and the "heavy feeling" in the head is relieved. It is probable that

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the whole attack can be considerably shortened, while many chronic cases clear up quickly. Plain downward stroking is all that is required (see Figs. 131, 132, and 133, pp. 297, 298). It should begin on the surface only, the pressure gradually increasing as the *séance* proceeds. After some ten minutes the palm of the hand may be placed over the area where the lymphatic glands are involved, and circular kneading administered for two or three minutes. The stroking is then resumed and gradually fades away into the surface variety again. Swallowing can be rendered less painful by taking a mouthful of water, then pressing the antitragus firmly into the external auditory meatus, so that the latter is completely closed. The water is then swallowed in small quantities, when it will be found that, on relief of the pressure on the ears, swallowing will be a comparatively simple matter.

In the treatment of tonsilitis the same plan should be followed, but the local treatment over the glands should be omitted while they are swollen or tender. The relief afforded may be very great, and it is probable that the duration of the attack can be curtailed.

Spasm of the oesophagus is usually a functional ailment. It can be most distressing to the individual. It may be one symptom among many, or it may be the solitary manifestation of nerve irritability. In the former instance treatment should proceed on the general lines mapped out for the treatment of neurasthenia. When the symptom is an isolated manifestation, it is usually possible to connect the spasm directly with some simultaneous mental excitement. In other words, the cause is hysteria rather than neurasthenia. One patient for many years rarely ventured upon solid food unless some one "in the know" was at hand ready to administer a very violent form of percussion to the dorsal spine. This invariably gave relief and suggested the correct line of treatment for similar cases, viz., systematic percussion daily throughout the dorsal region. This remedy, however, is probably an example of the use of physical treatment as a means of conveying psychical suggestion, and pure psychical treatment would probably prove more reliable.

Certain diseases of the *stomach* are amenable to massage

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treatment, others are not. In the latter event it may even be dangerous to perform abdominal massage at all. Thus, ignoring for the moment the ethical side of the question, the masseur who undertakes abdominal treatment without the recommendation of a medical man is guilty of a foolhardy act, which, should evil follow, could only be held to be severely reprehensible. Nothing could militate more against the chances of the patient's recovery than massage treatment for dyspepsia where the cause is the onset of malignant disease. Again, when we study *post mortem* a circular gastric ulcer with its base resting on the peritoneum—which alone separates the stomach contents from the general peritoneal cavity—it is possible to realise how highly dangerous massage treatment might be.

Considering the ethical side of the question, no advice whatever should be given by the masseur as to food or drink without consulting the physician—even the most homely remedies must not be recommended ; while to suggest the use of magnesia, soda, lemon, charcoal, or other remedies, should be possible only to those who care not whether they disgrace or honour their profession, and who are willing to drag their fellow-workers into the general condemnation which such breaches of etiquette deserve.<sup>1</sup>

*Atonic dyspepsia* is the form of gastric trouble for the relief of which the aid of massage is usually invoked. The causes of

<sup>1</sup> To most of my readers I hope that these remarks will appear to be unnecessary. Unfortunately this is not invariably so. I have cause to remember a medical man expressing to me his distrust of masseurs in general. On inquiry it transpired that his masseur had been prescribing a patent charcoal biscuit for his patient, and he had taken this exceptional behaviour as typical of what he might expect from masseurs as a whole. Again, soon after, I saw a lady suffering from sub-acute obstruction due to intra-abdominal adhesions. A fully-qualified Swedish masseuse had been giving abdominal massage for ten days. The patient's condition was steadily deteriorating, and my advice was asked by the doctor in charge as to whether it was wise to continue the treatment. The technique was good (though somewhat too vigorous). Something else was obviously at the root of the trouble. Investigation proved that the masseuse had advised a strong purgative pill, and one had been taken each night since treatment commenced. I had never heard of this masseuse before, but could not help thinking that it would have been impossible to imagine a more humiliating situation than mine would have been, had I been responsible for the recommendation of a masseuse who could be guilty of such an error.

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this complaint are numerous, and treatment must be modified to suit the requirements of each individual case. Thus it may be a symptom of neurasthenia, when local treatment is useless without due attention being paid to the general condition, as indicated in a previous chapter. It may be part of a general debility, as for instance after a severe attack of influenza or of typhoid fever. Here, too, general treatment is probably of greater value than local, as restoration from stomach trouble is dependent on that of the whole organism. In chlorosis the benefit of massage will probably be very partial until any toxæmia due to the chronic constipation has been overcome.

The atony may be the primary cause of other troubles, and then local treatment by massage holds out the best chance of recovery that the patient possesses. Chronic dyspepsia, from whatever cause, may lead to the atonic type. The chronic dyspeptic who over-eats, or drinks much beer or other fluid, affords the typical picture. In this country, where so many of us (and women in particular) drink too little to maintain the physiological balance within the body, the over-eating is probably the chief cause. The same applies to the French ; while in America iced drinks and (until recently) "cocktails," and in Germany beer-drinking, are probably the usual causes. Last, the atony may be due to structural defect caused by chronic over-stretching. This is not infrequently a symptom of visceroptosis, and always follows pyloric obstruction.

Be the cause what it may, the symptoms do not vary very greatly. There is always a feeling of oppression in the stomach, which may or may not amount to actual pain at intervals, usually after food. The patient may have a furred tongue and little appetite, but the "oppressed" feeling is often mistaken for actual hunger, and appetite may be voracious and thirst great. Acid eructations are common and flatulence is almost invariable.

Emptying the stomach regularly of its contents constitutes the cure, unless mechanical impediment is present. This alone can allay the inflammation of the mucous membrane, and thus enable the stomach to regain its powers of excretion. Moreover, when empty, the over-stretched muscle fibres are left at liberty to contract down to normal length, and thus regain their tone.

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Any form of dyspepsia may be a forerunner of the atonic variety. To prevent this sequence of events every effort should be made to empty the stomach. Thus, for the treatment of dyspepsia, whatever the cause, local treatment is always the same. As usual, massage may be employed for either reflex or mechanical result.

The stomach reflex area lies from the tip of the tenth costal cartilage on the left side to the sternum and then down the right costal margin. The technique is thus described by Dr. Douglas Graham, of Boston, Mass., in his text-book : "With the patient supine, place the phonendoscope or stethoscope on the right of the umbilicus. Place your right hand on the patient's abdomen with the tips of the fingers at the costal margins; then find the tip of the tenth rib, and with the tips of the first, second, and third fingers glide very gently with a trembling motion over the skin. It is the delicate, light touch which is efficient. After a few seconds or minutes, action will be heard beginning in the stomach. The first to leave is always the gas. Cease the stimulation until the contraction has stopped. Then begin again and continue till the stomach is empty, when a blowing, sighing sound will be heard. These treatments should be given daily, five hours after a meal, and last from twenty to thirty minutes, and should be continued for a while after recovery, to prevent relapse. Constipation usually accompanies this condition, and at the end of the first week the bowels move normally in most cases. It is necessary to continue the daily treatments until at 6 p.m., after an ordinary meal [*i.e.*, at one o'clock], there is no sign of splashing, distension or retention of food."

Nothing more need be added as to treatment, which aims solely at securing contraction by reflex. When there is no great dilatation this means will prove all-sufficient, but if the greater curvature can be shown by percussion—it may even be visible—more than two fingers' breadth below the costal margin, other means should be used as adjuvants. We rely now on two things : first, the reflex contraction of unstriped muscle in response to mechanical stimulation, and, second, the mechanical assistance we can give, to ensure that the fluid contents of the stomach pass outwards when the pylorus relaxes.

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If we notice the rate of passage of a peristaltic wave across the abdomen, it is seen to be very slow. A wave is started in response to mechanical stimulus at the left side and passes slowly across, relaxation following contraction. If a second stimulus is administered before the relaxation is complete, there is great danger of producing spasm, and all wave-like motion ceases. Add to this undesirable result the fact that undue stimulation is liable to paralyse the unstriped muscle fibres, and we see at once that there are two essential laws of treatment—the movements must be slow and gentle. The rate should be about twelve movements a minute and the pressure only sufficient to dent the abdominal wall. Any pressure submitted to the surface will be transmitted through the hollow viscera, almost as if the whole contents of the abdomen were a fluid mass and subject to the laws of hydrostatics—provided, of course, that the abdominal wall is sufficiently relaxed to allow of the transmission of pressure at all. The justification for considering the hollow viscera to be comparable to a fluid mass is seen whenever an abdomen is opened in the Trendelenburg position, when all the hollow viscera are found to have gravitated into the upper part of the abdomen, save only those portions that are bound down by the peritoneum to the posterior abdominal wall.

Throughout treatment, whether aiming for reflex or mechanical effect, the patient should be in a position to allow the fluid contents of the stomach to impinge upon the pylorus whenever this happens to relax. There is a double objective—first, to cause contraction and thereby to exercise the muscle fibres (thus increasing their tone), and, second, to enable them to rest to the uttermost after their contraction, which can only be accomplished if the stomach is empty. The fullest contraction of the elongated fibres cannot empty the stomach unless everything is done, by arranging the patient's posture, to ensure that the fluid escapes into the duodenum whenever opportunity affords. Thus a pillow should be placed under the left side of chest and abdomen, the whole trunk should be flexed as far as is comfortable, the thighs flexed, and the knees flexed and supported on a pillow (see Fig. 130). When aiming for mechanical effect, the little finger of the stroking right hand should follow the

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outline of the greater curvature, and there should be a distinct attempt, as it were, to push the stomach upwards against the diaphragm.

As already stated, constipation is frequently present, and no *séance* can be regarded as complete that fails to deal with this complication. Absorption is faulty, and therefore everything should be done to assist the portal circulation ; and, as it is more than probable that a general toxæmia is present in greater or less degree, a short time should be spent in general massage of the whole body.

As usual, full benefit cannot be bestowed by any external agency, and the patient should be instructed to use nature's own method of administering massage to the stomach, by practising deep breathing exercises, and a series of exercises should be designed of gradually-increasing severity for the abdominal muscles. Diaphragmatic exercises should always be utilised.

Surface stroking with surface vibration and deep stroking, with a vibratory movement incorporated in the stroke, are the only forms of massage that are permissible.

There are many neuroses of the stomach classified by Osler thus :—

### *Motor Neuroses.*

Supermobility.  
Peristaltic unrest.  
Nervous eructations.  
Nervous vomiting.  
Rumination.  
Spasm of the cardia.  
Pyloric spasm.  
Atony of the stomach.  
Insufficiency of pylorus.

### *Secretory Neuroses.*

Hyperacidity.  
Supersecretion.  
Nervous sub-acidity.

### *Sensory Neuroses.*

Hyperæsthesia.  
Gastralgia.  
Anomalies of the sense of hunger and repletion.  
Absence of sense of satiety.  
Anorexia nervosa.

An interesting comment may be made when reviewing this formidable list. Paul Dubois states that "ninety per cent. of dyspeptics are psychoneurotics," while Geo. Herschell puts the

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figure only less high. He says : " More than two-thirds of all the cases of this complaint met with in general practice [are] part of a general neurasthenia." <sup>1</sup>

Most of the motor neuroses not already mentioned can be benefited by massage, by restoration either of tone or of rhythm. They are chiefly nothing more than symptoms either of psychasthenia, hysteria, or neurasthenia, and tend to disappear or to remain according to the progress of the general disease.

Hyperacidity and supersecretion can both be remedied to a certain extent by massage. In the former a long drink when digestion is at its height,—say two or three hours after a meal, according to the food taken,—followed by massage, tends to rid the stomach of all irritating material, and may avert the sequel of chronic dyspepsia. In supersecretion it should be possible so to hasten the onflow of the gastric contents by massage as to minimise the risk of dilatation. Restoration of general strength and stability is the only method of cure. In sub-acidity cases the latter is the only course open to us, as the mobility of the stomach remains unchanged, and no irritating material is present which requires removal.

The sensory neuroses are all symptomatic of irritability of the central nervous system, and therefore call for treatment as outlined for neurasthenia. Local stomach treatment will probably be found useful from the psychical aspect.

It is usual to administer massage to the coils of small intestine, whenever general abdominal treatment is undertaken. The *raison d'être* of the practice is not clear. In the first place, during X-ray examination for obstruction, etc., it is the rarest thing possible, unless mechanical obstruction is present, for delay in the small bowel to be detected after the bismuth meal. Only if the cæcum is at fault or if a "kink" is present is delay noticed in the last few inches of the ileum, unless again there is organic obstruction. The aid of massage should then be invoked only in exceptional cases, and probably with a view to stretching adhesions under an old scar. Next, unless visible peristalsis is present, it is impossible to judge in what direction

<sup>1</sup> See "Problem of Nervous Breakdown," by Dr. Edwin Ash, p. 127.

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the contents of the bowel under the hand are moving. Thus it may easily happen that we attempt to force the contents of the bowel "against the stream."

Poisonous products do not tend to collect in the small intestine as sometimes in stomach or colon; when present, they lead to diarrhoea. For this condition massage may be of service, though it may seem bold to claim that one agent should be invoked to assist the cure of both constipation and diarrhoea. Yet so it is with calomel in therapeutics.

Most of us know the sense of comfort produced by a hot bottle or a vigorous rub over the abdomen when suffering from the "colicky" pains which accompany diarrhoea when the small intestines are affected. Moreover, a long railway journey is frequently beneficial in chronic diarrhoea. There must be some pathological explanation, and the most likely is that the heat relaxes spasm reflexly, while the rubbing and the railway journey act much as vibration in neuralgia, namely, by breaking the rhythm of the peristalsis, so causing relief of the spasm through the starting of another wave in a portion of bowel already relaxed. But the small intestine can, as a rule, be trusted to take care of itself, and certainly massage in diarrhoea should be administered with caution. The fear would be that absorption through the inflamed mucous membrane would be rendered more easy by manipulation, whereas there can be no call to increase the activity of the bowel, which is already doing all it can to hasten the passage of its contents. As delay in other conditions is quite exceptional, massage intentionally applied directly to the coils of the small intestine can only be required to stimulate peristalsis in exceptional cases.

It is not unusual to teach that general kneading and vibration over the small intestine stimulates glandular secretion. I was always sceptical as to the truth of this assertion, and I was delighted to read in Kleen's text-book, on p. 56, the following emphatic statement: "Abdominal massage . . . is, however, much less valuable for its effects upon the glands of the digestive apparatus and on the circulation than for its powerful influence upon the musculature of the alimentary canal." When we consider the large part played by chemical action in the production of the digestive juices, this conclusion would seem to

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receive confirmation. When a patient suffers from general atony, the "toning up" of the musculature of the small intestine by the reflex response to mechanical stimulation will doubtless aid it the better to perform its functions.

It must be remembered that the veins of the abdominal viscera have no valves, and that the venous flow is therefore dependent on external forces. Hence the necessity for massage over the central portion of the abdomen, whenever we wish to assist the portal circulation. But massage performed with this objective differs materially in technique from that which aims at assisting peristalsis. In either case the patient should be recumbent with the knees and thighs flexed by placing a pillow beneath the former. When dealing with the portal circulation only, the head and shoulders should be kept as low as possible, while, when administering treatment to the bowel itself, the shoulders and head may be raised. Again, when assisting the portal circulation there is no call for the use of vibration in any shape or form; deep stroking and kneading constitute all that is permissible. The pressure should be exerted from below upwards and towards the middle line, should be quite gentle—though, when the abdominal wall is properly relaxed, the hand will sink in deeply—and adequate time should always be allowed to elapse for the veins to refill before pressure on any spot is renewed. It is important, moreover, owing to the absence of valves in the veins, not to render the pressure intermittent as the hand passes upwards. In stroking the pressure is always even, but it is necessary slightly to alter the technique of kneading. - The hand is placed flat on the abdomen and the maximum amount of pressure is exerted at once. A rotatory movement is then imparted while the hand glides slowly over the surface. It is possible to compare the effect of the movements on the blood in the veins with two forms of waves. When stroking we can imagine the onflow of the blood to resemble the Atlantic roller sweeping on; while, when kneading, the wave would resemble the ripples on the surface of a swift-running river. It is often wise to work with both hands in unison, so as to act as uniformly as possible on the whole venous system of the abdomen.

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*Intussusception* is one of the common causes of acute intestinal obstruction. As a rule the ileo-cæcal valve invaginates, as it were, the wall of cæcum and colon; the latter then embraces it and attempts to pass it on as if it were a foreign body. Other parts of the bowel may be affected. The result is somewhat similar to that reported when two snakes tried to eat the same rabbit. The stronger represents the colon and the weaker the ileum, while the rabbit corresponds to the ileo-cæcal valve. After arriving at the point of junction the stronger proceeds to swallow successive portions of the weaker. Nothing should be more simple in the early stages than for the surgeon, by the use of massage, to evaginate the small intestine from the large. Graham reports many cases where this treatment has succeeded. There is no need to emphasise the fact that only in recent cases should massage be applied, for, if a few hours have elapsed, the bowel wall will have suffered to such an extent that it would perforate later, even if left to itself, and massage in this case must be exceedingly dangerous. None the less, it should be quite possible to relieve a very recent case by massage, and the technique should consist of applying massage in an upward direction to the ascending colon on the rectal side of the tumour, much in the same manner as friction is applied to the iliac colon. The enlarged mass should not be handled directly at all. The stroking begins close to it on the distal side and passes along the adjacent bowel. At the same time stroking in the opposite direction should be performed over the bowel on the proximal side. The chief difficulty would be to secure adequate relaxation of the abdominal wall. The delay of operation could not exceed fifteen to twenty minutes, as, unless success has been attained by that time, no amount of perseverance would be calculated to succeed.

Graham also reports several cases of acute intestinal obstruction that have been completely and rapidly relieved by massage. These must be chiefly cases of obstruction by bands. Without experience it is impossible to say what percentage of cases could be treated with success. It is certain that no attempt should be made if more than twelve hours have elapsed since the onset of the attack. Thirty years ago it would have been desirable to extend to massage a free trial in cases of this nature, but the

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improvement of surgical technique has rendered the danger of operation so slight, and its success so sure, that few will be found to advocate even the preliminary trial of massage in any case of acute abdominal trouble. Where a surgeon's help cannot be secured quickly, or the circumstances of operation are very difficult, the patient should be given the only chance available.

At the present time no reputable advocate could be found for massage in *appendicitis* while the appendix remains within the abdomen. It is a lamentable fact that this mode of treatment was ever suggested ; and it is not uncommon, even now, to see it alluded to as a possible alternative to operation. When once the appendix has been removed, however, massage frequently finds its *métier*. Operation is by no means the end-all of an attack of appendicitis ; and, although acute danger is averted by the removal of the appendix, there frequently remains much ill-health and suffering. This is due to the typhlitis or perityphlitis which has probably been coexistent. The very fact of the appendix having been diseased is evidence of possible faulty action of the cæcum, as witnessed by the number of patients who give a more or less definite history of constipation prior to the attack which ends in surgical interference. This loss in tone of the cæcum (with the inevitable dilatation) is a disaster which the removal of the appendix does little or nothing to rectify. Thus a neurasthenic—so-called—of seven years' standing made a complete recovery when the cæcum had been emptied and its activity restored by massage. Countless patients have submitted to operation in the sure expectation of relief, but have met with disappointment. This could be avoided almost entirely by the subsequent use of massage. The technique will be considered when dealing with constipation (see p. 400).

Now that the value of massage as a remedial agent is becoming more widely recognised, it is possible that some day English surgeons may be induced, far more generally than at present, to enlist its services in the *after-treatment of abdominal operations*. Few realise as yet how potent a remedy it is in the treatment of constipation, or how simple may be the manipulations that

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suffice to expel flatus. Half the discomfort that follows laparotomy is due to flatulent distension of the bowel, a discomfort that is magnified tenfold by the use of aperients. By the judicious use of massage it should be possible to avoid this cause of suffering entirely. Often all that is required is friction of the iliac colon, so that the hand need only touch the patient's skin over a small area some two inches to the "south-east" of the left anterior superior spine. This is a rare site for incision, so there should seldom be any cause to move bandage or dressing. Should this fail to secure the desired relief, kneading of the ascending and descending colon is possible through bandages, so that, in any case where a rectus incision has been made, a very good dose of massage treatment can be administered without in any way interfering with the surgical area.

After some operations, *e.g.*, gastro-enterostomy or anastomosis of any kind, the surgeon relies on the formation of adhesions to secure his junction. After nearly all other intra-abdominal operations the formation of adhesions constitutes a sequel which should be avoided to the uttermost. In abdominal massage we have an agent that is well calculated to reduce the formation to a minimum. Moreover, in any case of gastro-enterostomy which has not proved as successful as had been anticipated, massage treatment may convert failure into success. The treatment should not start until four weeks at least after operation, as the union probably does not become organised till then. The technique corresponds to that recommended for atony of the stomach (see also pp. 401 *et seq.*).

*Colitis* is "a secretion neurosis of the colon" (Osler). It is almost always associated with some irregularity of the central nervous system, approximating in its nature to neurasthenia. The more we see of this extraordinary complaint the deeper seems the mystery of its pathology. This being so, it is evident that treatment must be largely empirical.

There are two main types of colitis—mucous and ulcerative. It is probable that the latter is an infective disease, and serum or vaccine treatment often alleviates, if it does not cure. It is usually associated with diarrhoea, blood occurring in the stools from time to time. All local massage treatment is of course

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contra-indicated. Massage may be prescribed in order to overcome insomnia or to maintain the nutrition of the limbs. Stroking and rhythmical kneading of the limbs and back are indicated for the latter, and surface stroking only (as for neurasthenia) for the former.

In the case of the mucous variety two facts only are outstanding, the first being that it is almost always possible on palpation to feel one or more pieces of bowel in spasm, or at least to note with what ease spasm can be produced in response to the trivial stimulus of gentle palpation. The second fact is that the victim instinctively seeks warmth for relief, and it is not uncommon to find that she—the patient is almost invariably a woman, though occasionally a man in an advanced state of neurasthenia may suffer thus—has acquired the habit of crouching before a fire with the bare back exposed to the warmth. This occurs when alleviation of the pain and discomfort becomes the one overwhelming necessity of existence.

All treatment has so far failed to cope with this very distressing complaint when it occurs as an isolated manifestation of central nervous disturbance. The Plombière treatment meets with a varied amount of success. It consists of massage applied vigorously to the abdomen after the administration of a copious fluid injection. Spasm being one of the features of the disease, it is probable that the beneficial effect is largely due to actual stretching of the muscle fibres which have been accustomed to contract spasmodically, while the heavy massage is calculated to enhance the inhibitory action of the stretching. No one should ever undertake this highly specialised and drastic treatment unless qualified to do so by adequate training, and then only under strict medical supervision.

Treatment should be guided by these facts—first, that the disease is a neurosis; second, that the patient instinctively seeks for warmth over the spinal column (and often applies hot-water bottles to the abdomen as well); third, that inhibition gives relief.

As a neurosis, no form of “stimulating” treatment can be tolerated, and nothing but surface stroking should be administered. Any pressure exerted on the abdomen during massage—unless, as in the Plombière treatment, very vigorous over a

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colon previously distended—is calculated to excite spasm. The main area of the body that calls for attention is the back, this being the spot where the patient knows instinctively that the application of heat will give relief. The massage should consist, therefore, of back stroking only as advised for the treatment of neurasthenia. Every care should be taken to avoid chilling the patient, by keeping her adequately covered, and by paying due attention to the temperature of the room. If the patient is then conscious of any discomfort—if indeed she does not experience a most luxurious sense of ease and comfort—the technique is probably at fault, as the number of patients to whom this treatment is inapplicable is negligible. Surface stroking of the limbs may be added in any case where there are signs of general irritability. Later on, rhythmical kneading of the limbs may be added. In all cases which present any symptoms of insomnia, massage should be applied to the head and neck (see Chapter XXI.). Last, if inhibition brings relief, arguing from the relief of spasm that can be secured in voluntary muscles by surface stroking, an attempt should be made to inhibit the bowel spasm by firm surface stroking of the areas supplied by the intercostal nerves. The movement should begin near the mid-axillary line and pass downwards and forwards to the mid-line. For the sake of emphasis it is well to repeat that every effort should be made to avoid exerting any pressure which can possibly excite reflex response to mechanical stimulation.

All too infrequently the aid of massage is invoked for the treatment of *constipation*, as it affords one of the few chances of curing this very distressing complaint. As a rule constipation is an acquired evil, and often is attributable to errors in the physiological life of the individual rather than to pathological changes. In seeking to cure, we must bear in mind the proverb that “habit is second nature,” and aim solely at securing a regular habit. The reason why aperients fail to cure is that the irritation they produce becomes an essential part of the “habit”—no irritants or stimulus, no action.

Massage, of course, is unable to cure when the physiological error is continued, but there are some pathological causes

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which can be remedied. Amongst the causes of the latter type most frequently encountered is dilatation of stomach or of cæcum. For either trouble massage alone offers a prospect of cure. Suitable anastomosis by surgery may effect a cure, but the result is always a matter of profound speculation, whereas massage treatment, though often slow, is almost always certain. At least it can do no harm if skilfully performed, which is more than can be said of surgical interference in these cases.

For massage to be a success, the physiology of the case must be studied and all errors—dietetic and hygienic—must be corrected. For this reason, if for no other, the masseur should never risk a reputation by undertaking to treat a patient for constipation until the whole situation has been thoroughly investigated by a medical man. The danger becomes more obvious still when we remember that the sudden onset of constipation in an elderly patient is frequently the first symptom of malignant disease. It is plain, therefore, that ethical considerations and the interests of the masseur go hand in hand.

But, to be of full service to patient and doctor alike, a knowledge of the causes of constipation is essential; as it often happens that the masseur can extort information from the patient, in conversation or by observation, that might be missed during the ordinary professional visit of the medical man.

First and foremost is the question of habit. Many people owe the origin of this complaint to lack of supervision during the early days of life. In others the habit begins with the lack of provision of adequate time between breakfast and the start for morning school. In later life similar causes operate, and in quite a short space of time, the habit of a lifetime can be broken. There is an undoubted natural tendency in some individuals to be constipated, and these fall the easier victims.

Second in importance as a cause of constipation errors of dietary must be considered. In this country—and particularly amongst women—lack of fluid is an error responsible for much evil. To maintain a physiological balance at least three pints of fluid should be taken into the system daily. It is not at all uncommon to find that a female victim of constipation has been in the habit of taking no more than a half, a third, or even less,

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of this minimum. We might well follow the example of our American cousins in water-drinking.

Over-feeding entails over-loading of the bowel, but the presence of bulky excreta should not of itself cause constipation. Indeed, the reverse is true, for the more work we give a muscle to do the more its strength will develop. Hence the cures effected by agar and its preparations. But over-feeding combined with sedentary habits must be reckoned as a cause, and this fact indicates the line of treatment. When exercise is cut off there is always a tendency to constipation, chiefly on account of the lack of the natural "massage" of the abdominal viscera, which is inseparable from every movement of diaphragm and abdominal wall. Flaccidity of the abdominal wall must then of necessity be classed as another distinct cause.

The possibility of poisoning from drugs and such things as paint (plumbism) must be kept in mind when searching for the cause of constipation; and it is not infrequent to find it concurrent with inflammatory conditions in various parts of the bowel, e.g., colitis, chronic appendicitis, and chronic gastritis. After nearly all abdominal operations there is a marked tendency to constipation, which is directly proportional to the severity of the handling to which the bowel has been subjected. The injury done to the musculature of the abdominal wall renders muscular contraction a painful process. The pain or discomfort exerts an inhibitory effect and, unless steps are taken to prevent it, the effect is liable to become more or less permanent in a fair proportion of cases.

In cirrhosis constipation is common, and pressure on any point, or narrowing of the intestine, will obviously impede the passage of the intestinal contents. Under this heading the possibility of "kinking" or of the presence of adhesions must be considered. The former is a not uncommon cause in all cases of general visceroptosis. Muscular spasm alone may suffice, as in colitis. Muscular atony of any part of the bowel must of necessity impede the onward flow of the contents of the bowel, and atony of the cæcum is doubtless responsible, when appendicectomy fails to effect the cure that has been anticipated.

Last we may place as a not uncommon cause of constipation

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the lack of efficient innervation which follows any serious disease, particularly if there has been sepsis and neurasthenia. It may be a purely hysterical phenomenon, and is particularly common amongst the insane.

Considering the variety of the causes of constipation, it is no matter for surprise if, in the absence of information as to the cause, treatment should fail, or even, it may be, inflict injury. For instance, sacral beating may prove a most efficacious remedy for the plethoric patient who owes his trouble to over-eating and too little exercise, while it will inevitably aggravate the trouble if the patient is suffering from the faulty innervation of neurasthenia.

Treatment must be administered only after due consideration of the cause. We find that there are four main groups of cases, and treatment must be designed to suit the special needs of each group. The first comprises the victims of habit, and those in whom the trouble arises from taking an insufficiency of fluid, from poisoning, from disorder or disease of various portions of the bowel or the liver, from visceroptosis and kinking, or from muscular atony, and also post-operation cases.

The second comprises cases in which a definite accusation of over-feeding and insufficient exercise can be established, and hysterical patients.

The third comprises all cases of deficient innervation from whatever cause.

The fourth comprises all those cases in which the constipation is due to the presence of growths in the bowel, to narrowing by stricture of the bowel, or to pressure from external growths or tumours. It should also include most cases in which there is obstruction by bands or adhesions, and all cases in which the constipation is dependent, in whole or in part, on the presence of irreducible herniae.

Massage should ordinarily find no place in the treatment of a case of constipation the origin of which can be traced to any of the causes mentioned in group four. Occasionally it may be used in an attempt to stretch intra-abdominal adhesions. The chance of success is small, and there are possibilities of damaging a piece of bowel that is attached to, or pressed on by, the adhesion. Great care should therefore be exercised, and

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treatment should consist of slow, steady, and gentle pushing movements. If possible, the abdominal wall may be picked up and tension made on the adhesion by gentle pulling.

Treatment for cases comprised under the third heading should follow on the lines advocated for the treatment of neurasthenia. The constipation is purely secondary, and depends for its cure on that of the main illness. To try to enforce activity by direct massage is to risk the effects we should expect from flogging the over-tired horse. Slow, gentle, rhythmical stroking over the ascending and descending colons—provided, of course, that the abdominal wall is perfectly relaxed—will help the local condition, but nothing in the form of vibration of the iliac colon or of an attempt to secure the gluteal or sacral reflexes should be allowed.

In treating the glutton or the *bon-vivant* we can go “all out.” For reflex effect the patient may, if desired, be treated prone, and a firm beating over the sacral region may be administered with the ulnar borders of the clenched fists. In addition to, or instead of, this treatment, the patient is rolled on to the right side, the pillows are taken away, and the back is bowed. The left hip is well flexed and hacking is administered to the gluteal region to secure the so-called sciatic reflex. Then the patient is placed upon the back with the pillows under the head, so arranged that the shoulders also are slightly raised and the knees flexed over another pillow. The whole abdomen is treated by small circular frictions with moderate pressure, the skin moving with the fingers. Deep stroking of ascending and descending colons is then performed, an occasional break being made for vibration over various parts of the colon, but particularly over the iliac colon. However vigorous our treatment may have been thus far, it must not now be other than slow, gentle and rhythmical, and the vibrations must be well spaced.

This description has been misinterpreted to an extent that seemed hardly possible, and I have seen a mild, gentle “pawing” of the skin of the abdomen administered under the impression that it was what I advocated. By “slow” I wish to indicate that very rapid and heavy-handed deep-stroking should be avoided, and that a second stroke should not be begun over

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any given part until sufficient time has elapsed to allow the peristaltic wave of contraction to pass through all its stages, not only of contraction but also of relaxation. By "gentle" I mean that, provided the bowel is definitely pressed upon, there is no need to grind it between the fingers and the posterior abdominal wall. Compression is essential: crushing is detrimental. By "rhythmic" I wish to imply that unevenness

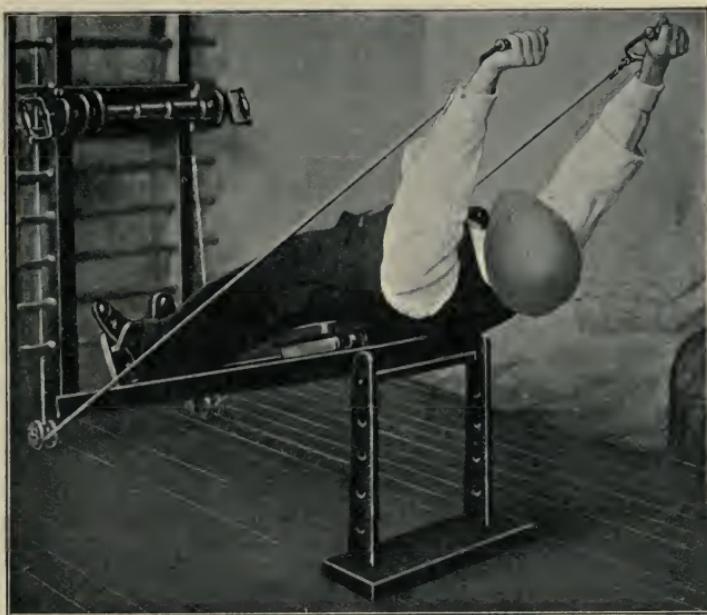


FIG. 149.—To show how the use of the sliding-seat and of the weight and pulley can be combined to afford a full dose of exercise to most of the muscles in the body.

in movement should find no place in treatment. A regular, even movement will not excite reflex contraction (protective) of the abdominal muscles, and, if these are maintained relaxed, our task is far more easy than if they are irritable and constantly passing into spasm.

Gentle kneading over the region of the gall-bladder follows—the chest, over the liver area, may be hacked, if so desired—and then the pillows are taken away from the head and shoulders and placed under the thighs and knees so as to secure a marked

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flexion at the hip-joints. Every assistance is now given to the portal circulation, and the local portion of the *séance* has come to an end so far as the actual massage is concerned. Many of these patients require treatment for obesity (see p. 373), and, as is usual in nearly all massage work, the prescription of exercises is absolutely essential to success (see Fig. 149). In every table breathing exercises should find prominent place. A little general massage to the back and to the limbs will not be amiss.

When treating the cases classified together under the first group due regard should be made to the requirements of each individual. The victim of lack of habit will derive most benefit from stroking of the ascending and descending colons and friction of the iliac colon. Even the old remedy of rolling a five-pound cannon ball over the colon may prove effective! But treatment will prove unavailing unless the necessity of establishing a regular habit is insisted upon, and to this end a pipe or cigar between breakfast and the start of the day's work may prove of valuable assistance. Sometimes a glass of cold water after breakfast may prove efficacious, or even a compulsory pause for reading or needlework.

In children colon stroking is usually all-sufficient if the dietary is correct. Sacral beating and gluteal hacking should be absolutely prohibited, especially in boys.

When poisoning is the cause of the trouble, it is very important to assist the portal circulation to the limit of our power, so that the poison may be eliminated with all possible speed.

In all cases of visceroptosis or kinking it is well to raise the foot of the bed on two chairs before beginning treatment, and gentle alternate pressure and relaxation may be applied to the whole of the abdomen in the hope that the general movement within the abdomen may help to "straighten things out." The pressure should be applied during expiration, and relaxation should coincide with inspiration. The muscles of the abdominal wall are almost sure to be poor in quality and quantity, and exercises should be given "spaced" with massage, chiefly of the picking-up variety. (See also the subsequent chapter.) Faradism, particularly with the Bergonié chair, may prove invaluable.

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Care must be taken to give treatment applicable to any stomach disorder that may be present. The treatment of colitis has already been considered.

If, as is sometimes the case, the cæcum has become a huge dilated reservoir, the patient should be treated as for visceroptosis. All attempts to empty it should be governed by laws similar to those laid down for the treatment of oedema, of which it has been said that it is useless to try to empty the bottle with the stopper still in place. Indeed, in all massage of the colon it is necessary to apply our treatment to the distal portion before attacking the proximal. When treating this type of case it is sometimes of service to elevate the foot of the bed.

Post-operative cases are not suitable for general abdominal massage owing to the presence of the wound. But there are few cases in which it is impossible to apply vibration to the iliac colon, and this simple remedy will often suffice to relieve.

Speaking of massage as a cure for constipation, Kleen says<sup>1</sup> : " H. Sahli, of Berne, recommended letting the patient, in lying position, himself roll a cannon-ball of 3 to 5 lb. weight over his colon. In spite of the indignation such a course would awaken among those *who attempt to surround the technique of massage with a nimbus of purely mystic difficulty*, I agree with Dr. Sahli's statement that the effect of this process in many cases is excellent." The italics are mine. There is no need to veil the massage treatment for constipation in a cloud of mysticism : the simpler the treatment the more efficacious it is likely to be. In support of this we can again refer to Kleen, who writes<sup>2</sup> : " Many classes of manipulations, so warmly recommended in some quarters, with circular strokings round the umbilicus, with pressures over the cœliac plexus (half-way between the ensiform process and the umbilicus), and over the splanchnic plexus (half-way between the umbilicus and the symphysis pubis), with sacral beating, etc., are empty 'ornaments,' or at least of very doubtful and certainly subordinate value, and one only wastes time over them." The only criticism I have of Kleen's technique is that he seems to lay equal stress on the value of treating the transverse colon and the other two por-

<sup>1</sup> "Massage and Medical Gymnastics," p. 536.

<sup>2</sup> *Ib.*, p. 41.

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tions. This seems to me an error, as it is impossible to administer the same treatment to a part of the bowel which is free to move under the anterior abdominal wall, as to other parts which are fixed to the posterior wall. Moreover, we know where these are to be found: we rarely know the exact position of the transverse colon.

The most famous spot for the treatment of "*liver complaints*" is, without doubt, Vichy. The treatment consists in the main of a fine spray douche over the hepatic region, followed by general kneading. The skin area over the liver is then treated by squeezing, gentle tappings with the palmar surfaces of the fingers follow, and finally the lower liver edge is subjected to very gentle kneading. The result is a feeling of general buoyancy and relief. It is stated that the liver is emptied of its fluids, the circulation through it is benefited, absorption is hastened, and the flow of bile increased. This stimulates the flow of pancreatic juice, and hence aids the absorption of fats. It also aids peristalsis and helps to relieve constipation. No account is taken of the regular hours, the enforced exercise, the administration of fluid internally, and the more or less strict dietary.

The improvement of patients at Vichy is of course beyond question. Where so many agencies are at work it is difficult to be certain to which of them should be ascribed the glory of success. For instance, it is probable that the increased fluid intake dilutes the bile, while the massage for aiding the portal circulation would assist the circulation through the liver and thereby stimulate all its functions. This seems a far more reasonable supposition than that the end is secured by kneading the lower edge of the organ—a very small portion of it can be reached directly—or by comparatively gentle taps on the surface which have to be submitted through the chest wall. In life the liver is little more than a semi-solid organ, contained within a firm fibrous capsule, as anyone who has watched the process of sewing up a rent in it can testify. This being so, the contents of the liver capsule must be subject to the universal laws of hydrostatics. Also we have seen that the other abdominal contents as a whole may be considered *en masse* as being

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semi-solid, so that any pressure exerted at any point must be transmitted equally in all directions. Hence during any form of abdominal massage, when any noticeable degree of pressure is exerted over an appreciable area, this pressure must in turn be submitted to the liver substance. It is thus in everyday life that the liver receives its daily dose of massage with every movement of diaphragm and abdominal wall. Doubtless this is the physiological origin of the adage "Laugh and grow fat," and the explanation of the great value of a ride on horseback when "a little bilious."

It is possible that we may be able to influence the liver, in some way unknown, by reflex as a result of surface stimulation, just as we can excite the stomach to activity. But, putting this possibility aside, the direct effect of massage on the liver must remain non-proven. To influence the liver and its functions by massage we can aid the circulation through it, and we can also doubtless imitate nature's own treatment of indirect massage *via* the abdominal wall by general abdominal massage. We can go further still and give indirect massage to the organ from above by prescribing breathing exercises.

Anyone who has been called upon to attend any considerable number of cases of jaundice must have been struck by the comparative frequency with which the symptoms begin to subside from the moment examination is made. This is usually attributed to skilful prescribing. Yet the careful physician never fails in any suspicious case to palpate the gall-bladder, and it is always possible that the "cure" originates in this simple act. The examining hand is pressed firmly down below the costal margin and the patient is told to draw a deep breath. Considerable pressure must be exerted on the contents of the bladder, and the unstriped muscle in its wall—little though there may be—is stimulated to contract. This must assuredly raise the pressure of the bile and tend to drive onwards any impeding plug of mucus.

At least it may be said that nothing but good can come if, as part of the routine treatment in general abdominal massage, we give a few gentle kneading movements over the gall-bladder during inspiration. Local treatment over the ribs which cover the liver may be added in the hope of securing reflex effect.

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Massage of the kidneys can produce a flow of urine and may be used for the purpose of aiding diagnosis during a cystoscopy. The kidney is "milked" between the two hands, or between the fingers and thumb of one hand, during inspiration. In no other circumstances should this treatment be administered. The organ is far too delicate for mechanical treatment to be free from danger. In fact, palpation of the kidney leads instantly to a transient albuminuria. Countless experiments have shown, however, that the output of urine is increased by massage and that the percentage of solids excreted is also increased. The total output of solids is therefore very considerable. Massage of the limbs alone can attain this end, but abdominal massage has a far greater effect, particularly if applied with the object of assisting the portal circulation.

Massage is sometimes invoked as part of the treatment of patients suffering from movable kidney. So many people—particularly women—have movable kidneys, and remain for ever in blissful ignorance of the fact, that it is impossible not to wonder whether those who are conscious of it, when the mobility is only slight, are not really suffering from some general hypersensitiveness of the central nervous system. This is tantamount to saying that most of those who recognise symptoms caused by the mobility of the organ are in reality suffering from neurasthenia. Much benefit can be derived from rest and massage treatment; but the latter must be general, and in the earlier stages, at any rate in part, should be of the type mapped out for neurasthenia. If the neurasthenic symptoms are not a prominent feature in other directions, then general abdominal massage should be administered. Every endeavour should be made to get the patient to put on weight, so that fat may be deposited in the kidney-bed. As the usual primary cause of the trouble is laxity of the abdominal wall, every means should be employed to build up its muscles. The chief of these means is the prescription of a course of exercises, very mild at the outset and increasing in severity very gradually day by day. Breathing exercises should be a prominent feature of all such tables.

Atony of the bladder may be remedied to some slight extent by massage in two ways: first, by reflex as the result of

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sacral beating ; and, second, by kneading just over the pubes. Massage of the prostate is best left in the hands of the surgeon. There is always risk of spreading infection locally ; and, if this must happen, it is better that he alone should take the responsibility.

On the Continent with some frequency, and occasionally in America, advocates of massage for the female pelvic organs are to be found. In this country the treatment has rarely, if ever, been extolled ; it can only be regarded with mistrust, and had better be left alone. Much benefit can be secured, however, by the treatment of many female patients with exercises as indicated in the following chapter. The treatment is both palliative and curative. The only form of internal massage that might possibly be given a trial is that devised by Professor Turck. In cases of haemorrhoids, when operation is refused, he inserts a rubber bag into the rectum and attaches this to a Politzerising bulb. The pressure of the air in the bag is alternately increased and diminished, with, so he claims, considerable benefit to the patient.<sup>1</sup>

<sup>1</sup> See Graham's "Massage," p. 243.

## CHAPTER XXVIII.

### MASSAGE IN OBSTETRICS AND GYNÆCOLOGY.

IF massage is of value as a remedial agent after abdominal operations, it is not less so in *obstetrical work*. Anything more grotesque than the treatment many women receive after child-birth is difficult to imagine. They are told to take all the exercise they reasonably can manage in order to keep in health up to the day of confinement ; then they are kept in bed devoid of any exercise for three weeks. In addition to this the abdominal wall has been severely stretched ; then the stretched muscles are placed under a most unwonted strain, it may be for hours. Small wonder then, that, when the stretching is relieved and the strain is over, the muscles simply "give out" and remain flabby and torpid. The muscles are naturally "stiff" and sore after their unwonted exertion, and the earliest attempts to contract them will cause some pain or discomfort. This will act as an inhibitory agent and, unless something is done to counteract it, the patient will leave them in a state of flaccid inhibition from which, not uncommonly, they never recover. As a rule no attempt is made to restore the tone and power of the stretched—and, when relieved, weakened—muscles ; and an inert binder is applied to maintain the intra-abdominal tension, which hitherto has always been the duty of the freely-acting muscles of the abdominal wall. The result is that the bowel is deprived of the "internal massage" which it has always received during respiration, and a tendency to constipation is inevitable. Add to this the fact that the expulsive powers are materially reduced, and it becomes evident that it is only reasonable to expect that the patient will have difficulty with defæcation and urination. This means that there will be faulty absorption from the bowel, and the sudden lack of exercise entails a decreased elimination of waste products. Further, the portal circulation is deprived of the chief source of assist-

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ance, namely, the contraction of the abdominal muscles. Then, when the patient is allowed up, the anterior abdominal wall is flaccid, so that, failing adequate artificial support, enteroptosis is assured to a greater or less extent.

The author has heard the sweeping statement made that in one part of the world a large percentage of women of the upper classes go completely "smash" after the birth of the first child and "are never the same again afterwards." It is certain that the amount of visceroptosis to be discovered amongst matrons in this country is a blot on the foresight of their medical attendants. There can be no excuse for the frequency with which a pathological change follows a purely physiological process. Nature could not be guilty of so grievous an error; therefore human management must be at fault. The remedy is simple.

The physical treatment in obstetrical practice may be divided into three stages:—

- (1) During pregnancy.
- (2) During labour.
- (3) During the puerperium.

During pregnancy the expectant mother frequently suffers from a multitude of ailments. These vary very greatly in severity, but it must be remembered that it is the minor troubles of this life which are often the hardest to bear. Comparatively few mothers pass through pregnancy to full-time without suffering in some degree from discomfort. In many the discomfort becomes positively acute. It is these minor troubles that physical therapy can help, and the lot of many women could be rendered far more happy were it more frequently employed.

During the early stages of pregnancy, and particularly in primiparæ, various nervous manifestations are frequently encountered. Nervous headaches are frequent, and every stage of disturbance may be encountered up to the condition of acute neurasthenia. In pregnancy, as, indeed, almost whenever this condition supervenes, massage stands out pre-eminent as a curative measure. If it is taken in time, the avoidance of insomnia is the one great prophylactic treatment for other forms of nervous breakdown. The treatment has already been described in the chapter dealing with neurasthenia (see Chapter XXI.).

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It would be good to know of any remedy that successfully combats the morning sickness which is so common in the early stages of pregnancy. Stimulation round the region of the spine of the fifth thoracic vertebra is well worthy of a trial in the hope that the pylorus may be induced to relax. In applying percussion to this area, it is well to note that the manipulations should not be carried below the level of the twelfth thoracic vertebra, or undesirable abdominal reflexes may possibly be excited.

Cramp in the legs, particularly in the calf muscles, is another very severe trial to a pregnant mother, and is a not infrequent cause of disturbed sleep. Five minutes' general massage applied to both legs—percussion of all sorts being prohibited—will probably do more than anything else to alleviate this distressing symptom, and, usually, it will be found to relieve it altogether.

At a rather later stage the patient may suffer a considerable amount of pain in the small of the back, and dry-cupping, as advocated for the treatment of lumbago (see Chapter XXVI.), will often give relief. Another pressure symptom, at a still later period, is swelling of the legs. This may be merely trivial, and pass almost unnoticed. In other patients a sense of discomfort is produced by quite a moderate amount of oedema, and this will often disincline the patient from taking her normal daily exercise. In a third class of case the swelling may be so great that the walking powers are reduced almost to zero. In massage, and in massage alone, have we any hope of securing relief, except by enforcing absolute rest in bed. There can be no question which is the wiser alternative; but even in the lighter cases, massage, properly performed, conveys a sense of comfort which affords so great relief that patients often instinctively long for it. Provided they receive skilled treatment, their gratitude is very great. The technique advised for dealing with oedema (see Chapter III.) should be strictly adhered to. The treatment should, of course, be sedative throughout.

Towards the end of pregnancy some patients suffer from a varying amount of discomfort, due to tension of the skin of the abdomen. Occasionally the irritation is intense. Complete relief can be afforded by massage, which should usually be performed with sweet oil. No pressure on the abdominal contents should

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be exerted. The movement must consist of light surface frictions and gentle picking up and rolling of the skin, and, possibly, even of gentle kneading.

More and more medical men are becoming convinced of the desirability of the mother nursing her baby. During the last two months of pregnancy, if it is apparent, or if we know from previous experience, that this is not likely to be accomplished, a great deal can be done before labour to counteract the tendency to failure of the milk supply. There is an old fable that the region of the breasts should be avoided when administering massage to a pregnant patient. Doubtless it arose in connection with the consideration that post-partem inertia can sometimes be relieved by putting the baby to the breast. Provided the treatment is skilful, this danger is purely theoretical. The technique should vary with the conditions found. If the breasts are atrophic, oil should be freely used. The palm of one hand supports the breast on one side while the other performs centripetal stroking. Slow, gentle squeezing between the two palms and frictions all round the periphery should end the *séance*. If the skin is not supple, cupping around the bases of the breasts may be employed.

During pregnancy some women suffer from constipation, and massage has been prescribed for its relief—as I am told, with great success. Personally, I should hesitate to prescribe this treatment under the circumstances; and, were I to do so, I should confine the massage solely to frictions over the iliac colon. To allow any other form of mechanical treatment for the relief of this condition during any period of pregnancy seems to me to court disaster of the most serious nature.

During labour, massage of the uterus is a well-recognised part of obstetrical treatment. It is only referred to here to emphasise the point already so frequently made, that unstriped muscle contracts by reflex in response to mechanical stimulation. Uterine muscle will take a lot of "punishment"; but, looking back through obstetrical experience, one cannot help wondering whether the treatment is not overdone, and whether the inertia, which is sometimes seen after delivery, is due in part to over-stimulation at an earlier stage.

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During the puerperium and after, countless ills seem to be attributable amongst civilised races to the direct effects of child-birth. Amongst savage races, so far as one can gather from literature, this is not the case. A negro woman, for example, carries on her work in the fields or elsewhere up to the onset of labour, and resumes it again almost immediately after. The civilised woman remains in bed for ten to twenty days, and not infrequently suffers severely. Surely there must be something radically wrong. Attempts of all sorts have been made to secure prophylactic treatment for prolapse and enteroptosis. Two or three generations ago it was usual for patients to keep in bed for ten days after a confinement. As these troubles still arose, the length of time was gradually increased in the hope that prolonged rest might secure relief from these distressing sequels. But the remedy has not proved efficacious. American and German obstetricians, finding this, swung round to the other extreme, and began to get their patients up at the end of a week ; but, however successful this may have proved as a physical remedy, as a method of psychical treatment it has proved a colossal failure. In civilised society it would appear that the ordeal of child-birth is one which the central nervous system does not stand particularly well unless a prophylactic dose of rest is administered. Just as there is all the difference in the world between prescribing movement and allowing function in the treatment of recent injuries, so, too, a vast difference exists between prescribing definite use of the muscles of the body once or twice a day while the patient is in bed, and allowing a full return to the ordinary activities of life. Neurasthenia and enteroptosis are both difficult to cure. Our object should be to devise some prophylactic treatment for both. Rest in bed is the prophylactic treatment for neurasthenia. It is unquestionably the cause of the other troubles. Exercise which shall prevent the onset of muscle weakness is the cure of prolapse and enteroptosis. Unless graduated with care, it is not the correct treatment, prophylactic or curative, for neurasthenia. We saw, when considering the treatment of fractures, that it was safe for a patient who was able to walk at the end of six weeks to perform active movement at an earlier date, and have passive movement performed for him earlier still, and that it

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was a mistake to leave the limb immobilised until function was permissible. So, too, it is a mistake to think that we gain any useful object by enforcing complete rest upon a patient for three weeks, and then suddenly allowing the full return to daily duty. Surely the more sensible line of treatment would be to allow complete rest immediately after confinement, and graduated exercises throughout the subsequent days. In this way, when the patient resumes her normal daily life, she will be able to do so without any undue or sudden increase of exertion.

It is desirable to this end that a definite therapy should be established, though, of course, actual detail must vary with each individual case. In devising a therapy the first question that arises is whether or no anything can be done to assist involution. At the Rotunda Hospital, in Dublin, an attempt is made to do this as a routine measure, relying on the reflex response to mechanical stimulation as a means to this end. The fundus of the uterus is gently kneaded with the palm of the hand. As we are relying on reflex response, the treatment should, of course, be very short ; and it may be administered for the first time on the day after confinement. The muscles of the abdominal wall, however, will almost inevitably be sore and painful. A great deal can be done to relieve this condition by gentle stroking, followed by picking up movements. The stroking is best performed starting from above in the axillary line over the lower ribs, following the intercostal nerves to the middle line, the hands meeting somewhere in the region of the umbilicus. The level of the stroke is gradually lowered until the lower portion of the abdomen is encroached upon. After five minutes or so of this treatment considerable relief will be afforded, and then the treatment to the uterus can be administered with little or no discomfort. Incidentally, this treatment may materially assist any atony of the bladder which may be present. The *séance* may terminate with deep stroking over the colon, followed by frictions of the iliac colon, in order to try to overcome the tendency to constipation. Throughout the treatment, of course, the patient's knees should rest upon a pillow. The patient may be advised to draw a few deep breaths at frequent intervals throughout the day. Deep sighing is an art which might well be encouraged. A quarter of an hour's treat-

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ment will be ample during the first two days unless any special symptom, such as cramp in the legs, calls for attention.

On the third day short, gentle massage may be administered to all four limbs. It should be sedative. No fear of causing any complication need enter our minds, as, unless the course of the puerperium at this point were normal and any dangerous sepsis out of the question, massage treatment would not be prescribed. The patient should be encouraged to make a little more effort during the performance of her deep breathing movements, which may now amount to gentle exercise.

Two days later the patient may be taught to draw up the knees alternately during inspiration, and extend them, pressing them out to their full extent, and fully dorsi-flexing the foot during expiration. Lying fully extended, with the feet crossed, the abdominal muscles can be taught to contract and relax, and slight arm movements up to the level of the shoulders may be added to the breathing exercises.

At the end of the week—provided the change in the lochial discharge is following the usual course—it is time to consider the stretched, and therefore inactive, and probably weakened, muscles in the perineal region. With the knees drawn up resistive exercises are given to the adductors, both excentric and concentric. This is one of Brandt's exercises for the treatment of prolapse. Actually it probably has no effect whatever on any of the internal muscles unless the patient is taught at the same time to contract the levator ani. When this is done, the contraction of the adductors seems to have a definite synergistic action. The contraction of the muscle is encouraged during the adduction of the knees. It relaxes during their abduction. Killogg's "inspiratory lift" exercise may be prescribed at this point. Respiration is checked in forcible expiration, and the abdominal muscles and diaphragm are made to perform the movements of inspiration, although no air is allowed to pass the glottis. The idea is, as it were, to cause a vacuum in the abdomen. Slightly more vigorous movement of the arms is encouraged during the breathing exercises, early alternate leg-lifting may be prescribed, and the lumbar spine may be pressed down upon and raised from the bed. Early attempts may also be made to raise the trunk in the crook lying position. Progress is gradually made till by

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the middle of the second week a definite table of exercises can be performed. The following would serve as an example :—

- (1) Lying, double arm forward and upward raise, with deep breathing.
- (2) Crook lying, sacral lifting.
- (3) Lying, feet crossed, back bending and stretching.
- (4) Deep breathing without arm movements.
- (5) Resistive exercises to the adductors of the thigh, with contraction of the levator ani.
- (6) Inspiratory lift exercise.
- (7) Stretch grasp lying, trunk raising, with assistance.
- (8) Lying, neck rest, alternate leg raising.
- (9) Repeat 1.

Most of this table might be performed twice a day and the breathing exercises at intervals throughout the day. A steady advance will be made until about the middle of the third week, when the patient might well be able to perform :—

- (1) Sitting, deep breathing with double arm rotation.
- (2) Crook lying, sacral lifting with double knee abduction and adduction.
- (3) Wing three-quarter lying, trunk raising.
- (4) Stretch grasp lying, double knee bending and stretching.
- (5) Wing sitting, alternate side bending.
- (6) Slack stoop standing with support, back extension.
- (7) Wing standing, with back support, alternate knee raising.
- (8) Breathing exercises.

Before treatment is concluded, a young and athletic patient may have advanced to a comparatively free table, such as :—

- (1) Wing standing, heels raise knees bend, with respiration.
- (2) Wing standing, alternate knee bending and extending.
- (3) Stretch standing, trunk forward and downward bending, with respiration.
- (4) Deep breathing.
- (5) Wing sitting, trunk rolling.
- (6) Foot grasp lying, trunk raising.
- (7) Reach grasp lying, double leg raising.
- (8) Crook lying, sacral lifting, with double knee abduction and adduction.

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(9) Prone falling, double arm bend and stretch.

(10) Deep breathing.

Naturally, not every patient can advance to this stage of athleticism ; but any young and reasonably healthy woman, with athletic tendency, can usually be built up in this way on tables which vary from zero to full strenuous exercise. The gradation, of course, must be slow and skilfully regulated. Due allowance must be made for individual idiosyncrasies.

I have departed from my usual practice of not including any account of Swedish remedial exercises in this instance, because I realise the vital importance of skilled treatment in connection with obstetrical work. Were the ordinary midwife able to take charge of the physical treatment of her patient all would be well, but it cannot be. It looks so simple to be " able to give a little massage " or " just to teach the patient a few exercises," and the general public—even medical men as well—do not realise how very far from simple treatment such as I have outlined really is. To be effective, and possibly even safe, a wide experience and a high degree of technical ability are essential.

Somewhere about the third day, the lying-in patient is liable to be troubled with her breasts. If they are painful and congested the breasts may be smeared over with sweet oil, and the lightest possible stroking should be performed from the periphery towards the nipple. As soon as the tenderness is somewhat allayed, light friction may be employed over any particularly sensitive part. If the flow of milk is inadequate, the treatment already mapped out as suitable before delivery can be continued, and Dr. Elizabeth Sloan advocates the passage of a weak faradic current for twenty minutes on alternate days.

A regular massage technique has been described by Major Brandt for intra-pelvic manipulation, as has been stated in the previous chapter. This has not been recognised as a method of treatment that should be adopted in this country. Not only is it open to obvious and great disadvantages, but, in addition, we must remember that the author of the treatment was not a medical man, and that it is impossible to accept his diagnosis in the cases for which he prescribed treatment. On the other hand, it cannot be denied that he laid great stress on the value

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of exercises for treatment of various conditions in the pelvic region, and that this form of treatment unquestionably affords us a guide by means of which it is possible to benefit many of those patients who, without physical therapy, would continue to suffer.

Many of the operations of gynæcology are performed for the removal of massive fibroid growths. This leaves the patient with a very considerably decreased abdominal content, and it stands to reason that, unless the walls which enclose the abdomen are submitted to treatment, considerable weakness and therefore lack of support must invariably ensue. The result is visceroptosis. Treatment for this condition can be arranged on lines similar to those suggested as suitable in obstetrical practice. It must be remembered, however, that patients from whom large uterine or ovarian tumours are removed are considerably older than most of the patients who bear children, and also that the condition has usually been progressive for many years rather than for months. Treatment, therefore, cannot be carried forward at a similar rate, and it may prove wise to omit the more vigorous exercises suggested altogether. When a tumour of any great size is removed, the stretching may have been so prolonged, and so great, that it is wise not to rely solely on treatment by exercises, but to add as an auxiliary graduated faradic contraction. Even treatment on the Bergonié chair may be required. Where any attempt has been made to fix the uterus to the abdominal wall, or to repair the perineum, all the exercise treatment must, of course, be postponed.

In the treatment of prolapse it is possible to do a great deal to benefit the patient by the skilful prescription of treatment by exercises. The plan already described as applicable to obstetrical cases is again an adequate outline, since prophylactic treatment corresponds almost identically to that for treatment of patients suffering from prolapse. One addition, however, is extremely useful when the condition has been established, and it is something which the patient can do for herself after retiring to bed at night, and before going to sleep. She assumes the knee-elbow position. The labia are separated so as to allow air to pass into the vagina. As this happens, the uterus drops automatically under the influence of gravity, forwards and

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upwards, and all strain is thus taken off the stretched and weakened ligaments. The patient rolls over on to her side and does not get up again until the next morning. The only thing that is calculated to disturb the re-position of the pelvic organs during the night is a violent attack of coughing. This, together with the systematic exercises already prescribed, will often suffice to cure the symptoms of prolapse, which, after all, is all that matters. The presence of prolapse of itself is not objectionable: it is only the symptoms which are derived from it that are of importance. It must be remembered that prolapse in women after child-birth is usually only part of a general downward slide of the whole of the contents of the abdomen, and that therefore general treatment is no less essential than the re-position of the uterus at night, and exercises designed to strengthen the perineal muscles and levator ani are of great value.

Whether anything can be done to assist patients who suffer from amenorrhœa or not, is, to my mind, an open question. I cannot help quoting from Kleen, who says: "So often have I observed an increase in the catamenia, and an earlier appearance than usual, in ladies who are, to all intents and purposes well, and who have had massage of the back or general massage for some slight ailments, that I have come to regard this as one of the physiological effects of massage. In amenorrhœa or dysmenorrhœa, where neither local treatment nor operative procedure is indicated, massage would seem to be a good means to employ, especially in atony of the nervous system and when there is not present any abnormal state of the blood or of any of the pelvic organs." Personally, I should be most reluctant to prescribe massage treatment in any shape or form primarily as a cure for any disorder of menstruation. Treatment for debility, for anaemia, and for functional disorders of the central nervous system by massage and exercises is a thing in which I have the greatest faith. If, as general condition improves, the general physiological functions of the body are also benefited, so much the better. It does not seem to me, however, that it is right to attempt in any way to treat a symptom and to ignore the cause.

If there is one symptom above all others of which the gynæco-

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logical patient complains, it is pain in the back. Doubtless displacement of the intra-pelvic organs is capable of causing pain, but a very large number of people suffer very severely from their backs who do not present the faintest trace of abnormality ; while yet more complain of the symptom when displacement is so slight that it is hard to believe that the symptom is due to this cause. Were it so, few women who have borne children would be free from constant and insistent back-ache. When we consider what has already been said on the subject of sacro-iliac "strain" and of lumbo-sacral "strain," and that women are liable to muscular rheumatism and fibrositis no less than men (even if they escape more freely from the curse of gout), it will become obvious that many women may suffer from back-ache without the symptom being due to intra-pelvic displacement or pressure. When we further consider that during child-birth the sacro-iliac joints are subjected to a relatively large amount of unusual mobility, it is not hard to realise that the ligaments may have yielded to a sufficient extent to allow a certain amount of abnormal rotation between the sacrum and the ilia. Again, unless steps are taken to restore it, the muscles of the abdominal wall are frequently weaker after confinement than they were before, and we have every reason to anticipate that this will alter materially the gait and carriage of the patient. Dr. J. G. Goldthwait, of Boston, Massachusetts, has produced overwhelming evidence to show that faulty carriage is responsible for a very great deal of pain and suffering connected with the back. In all cases of pain in this region, therefore, even if possible gynæcological causes are present, their presence should not be taken as proof positive that the cause has been found until examination has proved that there is no undue weakness in the abdominal walls, that the postural carriage of the trunk is faultless, that there is no undue pain or tenderness in the region of the sacro-iliac joints, and no exaggeration of the normal spinal curves due to one leg being developmentally shorter than the other. It is never wise to attribute back-ache solely to any displacement within the pelvis. It should always be remembered also that flat feet are a fertile source of aching pains in the neighbourhood of the back.

## CHAPTER XXIX.

### MASSAGE TREATMENT FOR DISORDERS OF THE CIRCULATORY SYSTEM.

GRAHAM in his text-book on Massage states: "In almost every conceivable form of weak and diseased heart I have been called upon to do massage, and usually with marked relief and comfort, before Schott or Oertel were ever heard of. While it was being done and for some time after, the patients have generally been able to lie on either side or flat on the back, and often to go to sleep in this position—what they could not have done before. In other cases, when it was possible for them to lie down at all, I have masséed with relief until within a short time of their deaths."

In this connection it is interesting to note Kleen's criticism of the heart treatment devised by Prof. Oertel, of Munich. He describes the massage technique advocated as "an absurd novelty," and adds, "this massage seems almost useless, like all that Prof. Oertel has written on the physical treatment of heart disease, beyond what has for long been practised in Sweden . . ." (See "Massage and Medical Gymnastics," p. 56.)

Graham also gives the accounts of different observers of the effect of massage on the heart. Very considerable reduction in size can be noted through the fluorescent screen after massage. A similar effect can, however, sometimes be noted by spraying the precordium with ether. This would prove beyond question that it is possible to secure some form of reflex effect upon the heart by local treatment. Experiments to ascertain whether the spraying of other parts—say the back or abdomen—would have a similar effect are not apparently recorded. Without this "control," the evidence of direct reflex *via* the precordial area must be considered as inconclusive. Most of us are familiar with a sensation of breathlessness when our feet first touch the water on a cold day, as we enter the sea for our morning

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bathe. This may well owe its origin to reflex action on the heart.

One physician, whose opinion commands respect by reason of wide experience of the treatment of heart cases by massage, affirms that the benefit of local heart treatment is psychical and not physical. This is probably true, and, if so, the treatment is obviously safe. If mechanical effect is secured it can only be regarded with doubt and misgiving.

We know, however, that one of the main causes of the symptoms of muscle fatigue is the accumulation of waste products within the muscle. The victim of heart trouble is always deprived of exercise, by which alone this poisonous material can be eliminated with success. Moreover, if a heart is weakened by disease, the kidneys rarely, if ever, perform their function efficiently. Thus it comes about that the heart-muscle must inevitably be fed by blood rich in waste products. The muscle fibres are therefore "fatigued" by poisons circulating through them; and, being weakened, they are all the more susceptible to this malign influence. A vicious circle is thus established. The heart fails, waste products collect, and the heart fails still more.

The objective in view when massage is ordered in any case of failing heart, from whatever cause, is therefore plain. It is to aid the elimination of waste products and to assist the heart's action, as far as lies in our power, by lowering any resistance which may be present in the venous system impeding the arterial circulation. Both these objectives can be secured by massage treatment, but there is yet another way in which massage can aid our patient. It has been said in an earlier chapter that a dose of morphia or heroin can do more to stimulate the heart's action, in suitable cases, than all the stimulants in the pharmacopeia combined, simply by affording the patient sleep and rest. Massage can effectively replace this dose.

When called upon to treat a heart patient we should therefore always aim at securing a marked sedative effect from our massage. Indeed, this may be all we are called upon to do during the earlier stages. If the patient is restless, in distress, and tired from lack of sleep, we have in massage the best remedy of all for him. Surface stroking of head and neck may

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be all that the sufferer needs to ensure several hours of profound sleep. In a few days similar treatment of the arms, and then of the legs, may be added.

As soon as the patient's capabilities of resting are showing signs of improvement, the surface stroking should gradually be replaced by deep stroking, given about the middle of the treatment devoted to each limb. As the patient improves, kneading of the limbs may be added, in order further to assist the circulation. This movement should be performed slowly, gently and rhythmically, and the *séance* should always begin and end with surface stroking. The patient thus experiences the sedative effect of the treatment, and, at the same time, we are able to secure an increased output of urine and to give a considerable impetus to the elimination of waste products. The assistance we give to the venous flow also decreases the work of the heart, and so we are attacking the vicious circle, at all points.

As soon as kneading movements can be performed with benefit, it is well to commence the administration of relaxed movements. These, by allowing the alternate lengthening and shortening of the muscles, maintain their elasticity, assist the venous flow, and stimulate the circulation through the parts moved. The patient is then taught to contract various muscle groups actively, even though no active movement is allowed to follow as the result of the contraction.

Presently the patient will be able to submit to abdominal massage. Previously this may have been impossible, as patients with valvular disease and failure of compensation are rarely able to lie down. If the trouble is due to asthenia of the muscle from any cause—usually strain, as the result of excessive training or exercise, fatty infiltration, or some prolonged septic illness—the patient will find difficulty in sitting up. Massage treatment is contra-indicated for cases of fatty degeneration and all acute endocardiac conditions. We have, then, a sure guide as to when it is wise to begin abdominal treatment, namely, in cases of valvular disease as soon as the patient can lie down, and in cases of myocardial trouble as soon as he can sit up, though the treatment will probably be given with the patient recumbent.

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Abdominal massage may be administered to help remedy any constipation which may be present, but its main objective should be to assist the portal circulation. This has been shown to increase the percentage of solids excreted in the urine more than general massage of the whole of the rest of the body.

Hitherto the effect of massage has been considered so far as it aims at securing sedative effect and at assisting the elimination of waste products. That benefit can also be derived directly from the mechanical assistance to the circulation is beyond question.

In the first place, the toning-up of the vaso-motor system in the extremities will secure a more efficient blood supply through them. This ensures a more even blood supply throughout the body, the capacity of the "reservoir" of the blood is thus, as it were, increased, and the work of the heart is correspondingly lessened.

Then, again, every assistance which is rendered to the return of blood to the heart, by affording a *vis a fronte*, must tend to decrease the *vis a tergo* which is required to ensure adequate circulation. This affords a further saving in the expenditure of cardiac energy.

As strength and general vitality return,—the result of improvement in the capacity for rest ; as the toxæmia decreases, due to the elimination of waste products ; as the heart gains in strength, owing to the mechanical assistance we are able to afford to it ;—so the general condition of the patient improves. Appetite returns, and with it there is increased assimilation of nourishment, and so strength improves, till, finally, the patient is able once more to resume exercise, by which alone health and strength can be fully restored. Surely, then, in massage, we have a rational treatment for all cases of valvular disease of the heart with the solitary exception of malignant endocarditis. Treatment by rest and drugs without massage is unscientific, in that it aims solely at remedying the main organ affected, and ignores the desirability of treating all the concurrent evils which must inevitably be present, and which, by physical rest alone, must be augmented and even multiplied. Even from the psychical point of view, active treatment in the form of massage must be held as immeasurably superior to rest alone

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and the regular administration of drugs. When we add to this the increase in comfort which efficient massage is able to convey, that the treatment hour forms the brightest spot in the tedious monotony of a long day, and that undoubted physical benefit can be assured, then we can realise how greatly it is possible to benefit these patients.

Treatment of victims of cardiac trouble by rest can be likened to the treatment of recent injury by immobilisation, the administration of drugs corresponding to the fixation by splintage. But the use of splints (or the administration of drugs) is in no way incompatible with treatment by mobilisation and massage, and by these means we are able to secure adequate rest to the parts which require it, while maintaining the health and vitality of all the other structures. Indeed, it has been proved experimentally that certain drugs have their efficacy improved by the administration of massage.

In the later stages of cardiac treatment the use of the Berlonié chair is invaluable, and should always be given a trial whenever practicable. Massage and mobilisation, however, provide a very efficient substitute.

Later still exercises must be prescribed. The brothers Schott have elaborated a special system at Nauheim. There is no reason why treatment should prove less efficacious in the privacy of the home. The exercises consist solely of carefully graduated relaxed and resistive movements, which in turn prepare the way for active movements. Breathing exercises should, of course, be given prominent place in any table of free exercises. These must, however, be regulated with great caution, as injudicious prescription of breathing exercises involves severe strain upon the heart.

Reference must also be made to the "terrain cure," which again can usually be simulated in the privacy of the home. In short, it consists of prescribing a definite dose of walking along paths of varying incline. The "path" can be mapped out on any hill in the country. I have never seen this treatment in progress, so cannot judge how prescription is regulated. No doubt elaborate examinations are made. In practice, at home or in the field, it should suffice to assure us that no excessive strain is being borne, if the patient is never in the least "out-

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of-breath" as a result of any exercise or movement. The object, when once the patient is ready to progress, is to arrange that he shall do in the near future what he could not do to-day without this happening. It should be noted that progress is not by any means uniform. It is a mistake to insist on daily progress whether or no the patient "feels up to it." On an "off" day let him rest, and more will be gained on some not very distant morrow than by causing fatigue to-day.

Throughout treatment a careful watch must be kept for any trace of fatigue. This is shown by altered respiration, by change in pulse or colour, or by restlessness. It is important that the masseur should be able to take the pulse; and should have sufficient experience to note changes therein. This can only be acquired by practice, and it would be well, therefore, if all masseurs familiarised themselves with the normal pulse by examining it in every case treated in hospital or during training. In private work, except in heart cases, such examination might sometimes be regarded with disfavour, and might lead to uneasiness and doubt in the patient's mind.

The treatment of *angina pectoris* has been referred to in Chapter XXII., and also the treatment of *arterio-sclerosis* and its frequent companion, *chronic renal disease* (see Chapter XXVI.).

Fatty infiltration of the heart was considered on pp. 374-376.

Disorders of the venous system may be considered under two headings, *varicose veins* and *thrombosis*.

It is difficult to say how, or why, massage treatment should benefit *varicose veins*. It is sometimes taught that benefit is bestowed by the action of the massage on the unstriped muscle in the walls of the veins. This explanation seems to me to be more than doubtful; first, because there is so little muscle present, and, second, because what there is has been so stretched by the dilatation of the vein that return of function is almost incredible in long-standing cases. The fact remains that assistance can be given. It is probable that in ordinary life the patient never assumes a posture which allows the veins to empty completely, and so their walls remain constantly under tension. Massage can at least relieve the tension temporarily, and this may be responsible for the benefit which it can

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undoubtedly bestow. Treatment should therefore be given, whenever practicable, after the patient has finally retired to bed for the night. It should consist of the deep-stroking variety in the main, and should be performed slowly, with just sufficient pressure to obliterate the lumina of the vessels. Any more severe pressure can only tend to inflict injury upon the already stretched and weakened walls of the veins. If hard or tortuous, the veins should be left alone, and treatment be confined to areas where it is possible to assist the collateral circulation. Varicose patches should be avoided likewise. In these the venules sometimes rupture spontaneously, so even the lightest form of massage cannot be regarded as free from danger when applied directly to them. The leg during treatment should be supported by pillows, so that the thigh and knee are both flexed to half a right angle. If a bandage is to be applied, this should be done before the position is altered.

The condition of varicose ulcers—even of long standing—can be greatly ameliorated by massage. In addition to general treatment for the circulation, the whole area for some distance around the ulcer should be vibrated with care. The ulcer itself may be covered by gauze and subjected to soft vibration. All scraping of the surface must of course be scrupulously avoided.

(See also p. 196 for description of technique.)

The treatment of *thrombosis* by massage is a very serious problem. If severe sepsis has been present, it is still more serious. The very life of the patient may be involved by an error in technique, since massage over a vein in which thrombosis is proceeding is calculated to spread the trouble, and, even when the active process is only recently quiescent, injudicious handling may lead to the separation of an embolus.

The signs of thrombosis have been considered (see p. 144), and should be familiar to every masseur.

Whenever this condition is present, recovery depends on the education of collateral channels to take on the work of those which have been obliterated. Occasionally the obstructed vein may function once again by absorption of the clot, but usually the blood finds its way into other channels.

Treatment should be administered with the double objective

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of aiding the venous circulation and of reducing the oedema which will inevitably be present.

After aseptic thrombosis, such as in the posterior tibial vein after simple fracture in the leg, massage treatment may be resumed with the utmost care and gentleness some four weeks after the cessation of the spread of the symptoms. Active movements may be prescribed about two weeks later. This is conservative treatment: it is wise to be over-cautious when the patient may pay for our rashness with paralysis or even death.

After septic thrombosis, on the other hand, as in femoral thrombosis after confinement (white leg), it is rarely safe to begin massage till two months at least have elapsed. Treatment should consist of surface and very gentle deep stroking—all the muscles, of course, being completely relaxed. Slow, gentle kneading may be given to all structures except to those areas where pressure is likely to be transmitted directly to the damaged vein—e.g., the thigh and anterior part of the leg may be treated if the posterior tibial vein only has been affected. The popliteal space, Hunter's canal, and Scarpa's triangle should all be avoided during treatment, if the vein in these areas has been involved in the thrombosis.

Relaxed movements may be given, but with caution. Active movements may be prescribed from the end of the third month. It is not unusual to hear of patients spending six, and even nine, months in bed, so there is no need to "push" treatment—a process that can only be described as dangerous. "General" massage is rarely safe till the fourth month.

The treatment of *haemorrhoids* has been considered (see p. 411), and also the various spasmodic conditions which occur in the arterial system (see Chapter XXII.).

## CHAPTER XXX.

### MASSAGE TREATMENT FOR DISORDERS OF THE RESPIRATORY SYSTEM.

IN nearly every book on massage much space is devoted to the treatment of scoliosis and similar deformities. Not so here, however, as massage for these cases is of small service. The remedy consists of exercises with which the present work does not pretend to deal. As stated in the preface, though it is well to emphasise it once again for fear of misrepresentation, I have only attempted in these pages—with rare exceptions—to indicate how the movements of massage should be performed, what effects we may reasonably expect to secure as the result of these movements, and what our aim should be when called upon to treat various conditions. When “exercises” have been described it has been my aim to fill the gaps that appear to me to exist in many of the ordinary text-books.

As already stated over and over again, massage is merely a means to an end, and that end is restoration of function. If it is true that “movement is life,” massage alone as a remedial agent can rarely, if ever, suffice to cure. It can prepare the way for, and can assist in, the performance of the one and only means by which function can be fully and finally restored—the prescription and performance of suitable exercises. It is impossible to record these here, for they cover the whole realm of Swedish educational and remedial exercises.

Massage pure and simple plays but a small part in the treatment of deformities of the chest or of diseases of the respiratory system. They can therefore be dismissed in a few words.

*Laryngitis*, even in its acute stage, is amenable to massage treatment; in the chronic stage great benefit can be bestowed on the patient. The ordinary “clergyman’s sore throat” is purely due to posture. The barrister, who always speaks with

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his chin raised to an audience placed above him, never suffers from any vocal effort. Many clergymen who address their congregations from a pulpit do so. Keith has assured us that the human larynx could not have been perfected without the assumption of the upright attitude. As a prophylactic, then, it is our duty to teach any one who has to strain his voice, to do so with head well thrown back, and no evil will follow even prolonged strain. Those who cannot learn this trick can derive the utmost benefit if we teach them to stroke their own necks downwards for a few minutes after every occasion on which they are called upon to do much speaking.

In all cases of acute laryngitis—except, of course, in septic cases such as those of Ludwig's angina, when massage is strongly contra-indicated—great relief follows rhythmical down stroking of the neck (see Figs. 131 to 133, p. 297). The *séance* should be short, not lasting more than eight or ten minutes.

Massage treatment in *acute bronchitis* can rarely, if ever, be advocated. It might be possible to assist the expectoration of "sticky" mucus by very gentle hacking over the apices and the back. The clothes should not be removed, as no exposure whatever is permissible. Massage treatment of the head and neck would help a patient who was suffering from insomnia.

In *chronic bronchitis* there is almost always a certain amount of chronic over-distension of the air-spaces of the lungs. Thus the treatment of chronic bronchitis may be considered together with that of emphysema.

Mont-Dore is the elysium of sufferers from these complaints. The treatment consists of douche treatment applied to the thorax, and subsequent inhalation; the amplitude of respiratory movements is definitely increased thereby. But, as Graham points out, massage treatment is of far greater general application, and is available for those who cannot visit the South of France. Moreover, he quotes cases to prove that massage alone can very nearly equal the douche in improving respiratory movement. So, when we remember that to massage movements proper we can add compression movements and exercises, it would seem that much can be done to aid patients in their own homes.

Local massage treatment should consist of deep stroking and

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kneading of the intercostal muscles and of percussion over the apices and back—the former for the amelioration of the actual chest movements, and the latter to loosen mucus.

It is well to remember that the emphysematous patient can rarely take adequate exercise, and that often the heart is enlarged. Treatment should therefore follow closely on the lines laid down in the previous chapter when dealing with disorders of the heart. The right side of the heart is the one that suffers most in these cases, and so there will be definite indication for abdominal massage, designed particularly to assist the



FIG. 150.—To illustrate the position for a special breathing exercise when the patient has suffered from a left-sided empyema. The hand of the masseur is placed over the area marked by the cross, and the patient endeavours to push the hand away during inspiration.

portal circulation. Many of the patients will be found to suffer from flatulence, so massage of the colon will frequently be indicated; many also are obese, and appropriate treatment should be added. But the real agent through which alleviation comes is exercise, suitably designed and adequately taught. Massage can prepare the way; in no case can it supplant treatment by exercises.

Little can be done to aid the sufferer from *bronchiectasis* by massage; but it would always be kindness to instruct parents to administer mild hacking and clapping over the bases of the lungs during the morning evacuation of pus. It might well hasten this most unpleasant process.

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Graham reports a paper published by Schlegel advocating the use of percussion in cases of *pleuritic effusion*. "For this purpose the ulnar border of the hand was used striking at the rate of two blows per minute" for five minutes, two *séances* being given daily. Non-infected pleuritic effusion is usually absorbed without difficulty. Failing this it can be relieved by tapping. If it were infected, percussion could hardly assist in the cure. It is not likely, therefore, that we shall be asked to deal with any case of pleurisy. It is a fact that there is some connection between the surface of the chest and the lungs, and it is possible that the pain of pleurisy might be alleviated by frictions over the intercostal muscles. On auscultation it is usual for the patient to complain that some spots are tender when touched by the stethoscope. Friction gradually approaching these points might well afford relief by reflex.

The treatment of the sequalæ of *empyema* is almost entirely a question of exercises. They should be designed to mimic as far as possible Abbott's treatment for scoliosis by means of the plaster-jacket. In other words, the patient should be taught to expand the base of the lung of the side affected, when, by posture, the chest wall over this area is submitted to the fullest degree of tension that is possible. Thus, for a left-sided empyema, the patient is placed in the lax-stoop-sitting position. The trunk is then rotated to the right and the forward bend is accentuated. A hand is now placed over the left lower ribs behind, and the patient is instructed to try to push the hand away during inspiration (see Fig. 150). Other remedial and educational exercises should be prescribed as the nature of the case permits. Particularly valuable among the former are lateral costal breathing and one-sided breathing exercises, arranged in order of progression. Blowing a child's windmill is an excellent exercise.

Massage treatment, if required, should be purely symptomatic. There are no definite indications.

## CHAPTER XXXI.

### THE TREATMENT OF DEFORMITIES.

IT is usual in text-books on massage to devote a separate chapter to the treatment of deformities, and I have chosen to follow the usual practice in the hope that I may be able to emphasise the fact that, in their treatment, massage plays but a small part. It may, however, serve as an important accessory.

The question to be solved is how best we may assist the orthopædic surgeon. We may be called upon to prepare the way for operation. This usually means that massage is required to promote the nutrition of the part. The laws laid down elsewhere should serve as an efficient guide.

Occasionally massage is invoked to aid in the prognosis of a case. When this is done it is essential that the surgeon in charge should give detailed instructions as to the manner in which he wishes the case to be treated and state the *raison d'être* for the instructions given. His wishes must be obeyed loyally; beyond this it is impossible to offer advice. If it is desired that massage should test as far as possible whether past sepsis is sufficiently overcome to render operation safe, the masseur must "go all out." A prolonged dose of cupping will usually betray the presence of latent sepsis in the skin. Otherwise the area of operation should be subjected to vigorous kneading, friction and vibration. Though he should not intend actually to produce bruising, the masseur should not be blamed if he oversteps the mark slightly. The test is rough and ready and not too reliable, as we cannot by massage break up an encysted focus of infection which the surgeon may cut across. It is, however, the best we have, and has saved many patients from premature operation.

After operation, massage may be prescribed to restore or to maintain the circulation, or to prepare the patient for a

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course of exercises and to assist him in their performance. Again, the general rules laid down elsewhere should prove sufficient guide.

Either before or after operation it may be our duty to loosen scars, to stretch adhesions, restore mobility, and so on. After operation our treatment must always have in view the sole end—restoration of function. This must depend on exercise, and on exercise alone. Massage can merely assist. It is only possible here to lay down general rules for treatment. The most important are, first, that if massage is given at all, the whole limb, or at least the whole segment of the limb, must be treated and not only that which is adjacent to the site of operation. Indeed, this should usually be the last part of the whole limb that we should treat. Any part of the limb which can be kept nourished by active exercise requires no massage, except in so far as it may serve as an incentive to active movement.

Then, second, if the surgeon has endeavoured to stretch some structure, the table of exercises should always be framed with a due regard to his intentions. This means that every exercise should be designed to lay further stress upon the structures which he has already tried to stretch, and to contract or shorten those he has tried to release.

In the treatment of feet, for example, if the surgeon has wrenched a flat-foot and maintained the correction in a plaster cast, it is obviously acting contrary to his wishes if exercises are prescribed for the patient that can by any possible means lay strain on the plantar ligaments. Thus the ordinary heels-raising-knee-bending exercise with the toes turned out is absolutely contra-indicated till a very advanced stage of treatment has been reached. Co-ordination exercises, walking on the outer edges of the feet, ordinary walking in boots with the inner side of the heel raised, tip-toe walking with the toes turned in, lessons in standing with the feet parallel and crossed with the weight on the outer borders when sitting, quadriceps training and exercises—these are all safe and legitimate. On the other hand, if an attempt has been made to flatten out a case of pes cavus, the very opposite line of treatment should be followed. The patient should be instructed in heel-walking and to perform exercises in the lunge position, while heel-

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raising exercises of whatever description should be postponed till the last.

In cases of hallux rigidus or valgus massage can prepare the way for operation, and can assist greatly if "spaced" between the various exercises afterwards. It is possible also to assist in the maintenance of the mobility of the joint. The ordinary laws of administering relaxed movements must be obeyed, and, speaking generally, the earlier movement is started after operation the better is the result. It is often of service to put a certain amount of longitudinal tension on the toe while performing the movements. It is essential in these cases to know whether the surgeon has divided the bone completely or not at the operation. In the former instance, as there is a complete fracture, progress should be more slow than in the latter, where the fracture (if present at all) is of the greenstick variety.

In the post-operative treatment of hammer-toes it is vital that we should be told whether the surgeon is aiming at an ankylosis, or wishes to secure a movable joint. In the former case exercises alone should be given when union is firmly consolidated; in the latter, the joint should be kept supple in so far as full extension is concerned. No attempt to secure any marked degree of flexion should be made.

But it is only the very severe forms of foot deformity which are subjected to operation. There are countless sufferers from foot trouble of greater or less severity for whom no surgeon would perform an operation. Yet the lives of these patients may be rendered miserable by their feet, their occupation endangered or rendered unduly laborious and painful; or they may be condemned to a sedentary life when yearning for activity. Holidays, too, are deprived of nearly all their pleasure, and sport of all kinds is prohibited. These patients have only one hope of relief, and this rests on the provision of proper footgear and on skilled re-education. No amount of treatment by "massage and exercises" can ever help a patient who is not properly shod. The first essential, therefore, is to know exactly what this means.

I have learnt from Capt. James Patterson, C.A.M.S., of Vancouver, a large part of my present knowledge of boots,

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and it was he who first showed me the "foot-drill" described when dealing with claw-foot. He kindly provided me with photos, from which Figs. 154 to 157, inclusive, have been taken; and it is largely due to his work, and to the interest that he inspired me to take in "foot conditions" generally, that I am able to enter into far greater detail now than I accomplished in the first edition of this book.

The boot or shoe must be three boot-sizes longer than the actual length of the foot (measured without any portion of the body-weight being placed upon it), if any degree of "shaping" at the toe is to be allowed. Two and a half sizes is enough if the toe is to be built rigidly to the shape of the foot; but this few patients will allow, as the shape of the boot will then be triangular with the base of the triangle forward. A greater allowance even than the three sizes must be made if any considerable degree of "pointing" at the toes is demanded. When we remember that a "boot-size" is usually taken as three-eighths of an inch—some boot-makers count it as one-third—it follows that most boots, and particularly those built for ladies, are made or fitted too short. Moreover, it must be remembered that the foot is usually measured without the body weight; when weight is placed upon it, the foot may show an increased length of a full size, or even more. The breadth of the "upper" also requires attention. The inner side of the boot must be straight, or even slightly sloped inwards, right away from the "waist" of the shoe up to the extreme tip. The common build of boot, where the inner side slopes outwards from the level of the first metatarso-phalangeal joint, is fatal to success. There must also be room for each individual toe to rest flat upon the ground in full extension and in a straight line with the mid-line of the corresponding metatarsal. The only place where "snugness" can be permitted at all in the fore part is just *behind* the heads of the metatarsals. Everywhere in front of this the foot must be absolutely free to move and, if necessary, to expand.

The sole should be flat and not, as is so common, built to slope upwards from the level of the metatarsal heads to the front end of the sole; and the slight convexity from side to side, which is so commonly seen, should be done away with.

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It is evident, therefore, that most patients with foot trouble must be shod with footgear far larger than they are accustomed to wear. If it is procured ready-made the result will be bad, for the back part will fail to fit. If, on the other hand, the heel and the "waist" part of the upper are made to fit, the unwanted size elsewhere will only tend to comfort. The result of the finished article does not sound alluring. As a matter of fact a perfect boot, from an anatomical and remedial point of view, can be made to appear quite "presentable." But it will be large.

It cannot be too strongly emphasised that the ordinary plan of blocking out hollows in the sole or bulges in the upper is merely a makeshift. It may give relief, but it is usually temporary and is in no sense remedial. It is, in fact, treating a symptom and not the cause, and the general result is aggravation of the condition. Other devices, such as arch supports and "building up the instep," should be placed in the same category. Any or all may help to keep a patient in comfort, and this is saying a great deal; but they do not cure, and the patient is rarely able, even with their aid, to lead an active life or even to take full advantage of a holiday which entails much active exercise. Some are content not to do either: for them palliative measures are all that are required. A few patients—very few comparatively—are well-nigh (if not quite) incurable, and for these again, bars, supports and so forth are of the greatest service. But many a patient finds his foot trouble a handicap in life—for business or for pleasure—and for him any chance of recovering a usable foot is worth offering. Given proper footgear and given perseverance with exercises, it is often surprising to see how great an improvement can be secured.

If, however, there is any trace of osteo-arthritis change in any of the joints posterior to the metacarpo-phalangeal joints, the outlook should be regarded pessimistically. Recovery is, to all intents and purposes, impossible, and the only hope of relief—if free mobilisation fails us—is to attempt so to fix our patient's footgear that movement at the affected joints is reduced to zero.

If treatment is useless in the absence of proper foot-gear,

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so, too, the latter is usually insufficient to cure without other definite remedial measures in the form of exercises or foot-drill and, in severe cases, of splintage.

The flat-foot "drill" has been already dealt with so far as the earlier exercises are concerned (see Chapter XX.). Those that follow (designed for the treatment of claw-foot more particularly) may also be added. But the two points on which emphasis should be laid are the necessity for keeping the quadriceps taut while standing, and for sitting with the feet crossed so that "clawing" may be practised at every opportunity. The patient should be taught to mould the foot into its proper shape at least twice a day. Flat-foot of itself is not a disabling condition. Every ballet-dancer is flat-footed as judged in the rest position. In activity, however, the mobility of the foot-joints at once allows restoration of the shape of the longitudinal arch, and it is the loss of this mobility which is the cause of trouble in cases of *painful* flat-foot. Recovery cannot therefore take place until mobility has been restored. The patient should also be instructed to have the heels of all shoes and boots wedged so that the inner border of the heel is raised. Half an inch for an adult of about six feet and about a quarter of an inch for a child is sufficient. The wedging is often done most ineffectively. It should be so arranged that the end of the back seam is vertically above the centre of the heel when the latter is resting on the ground. The outer side of the heel should be vertical and not sloped inwards. Finally, the whole surface of the heel should be covered with rubber, and this should rest flat upon the ground when the outer edge of the sole also rests upon it. It is very common to find that the wedging has been done so that the slope of the heel renders stability insecure, or that the weight of the body rests mainly on the outer of the two sharp angular points at the front of the heel. Both are radical errors.

If metatarsalgia is present, the anterior arch has given way. In Morton's disease the patient usually complains of a "live nerve" in the sole of the foot, which causes intense pain on pressure. This is due to a true traumatic neuritis, which follows bruising of a digital nerve, either between the metatarsal head and the ground or between the heads of two adjacent

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metatarsals. The pain is intolerable and life is a misery. The obvious treatment is to shield the nerve from the injury until the effects of the trauma have subsided. This can best be done by shaping a felt pad, which is to fit accurately behind the arch of the metatarsal heads. It is held in place by a band of  $2\frac{1}{2}$ -inch elastic shaped round the foot and sufficiently "snug" to afford considerable lateral support to the arch. In mild cases a small pad may suffice, but in severe cases it may be necessary to carry it back to the heel so that the whole of the sole of the foot is supported up to the level of the metatarsal heads, which are thus allowed to hang free in the boot, supported so that they just fail to touch the leather sole at all. While these palliative measures are being taken, muscle training, as about to be described, must be instituted.

By far the most common cause of metatarsalgia is not, however, neuritis, but rather an arthritis, a periostitis, or both. The condition may be due to one of three conditions. First, general weakness, due to prolonged illness, may have led to a simple dropping of the arch, together with a thinning and general softening of the plantar skin and subcutaneous tissue. The three middle metatarsal heads thus lack their usual protection and, at the same time, are called upon to bear a portion of the weight to which they are unaccustomed. Second, the trouble sometimes arises from pure indiscretion, such as walking on a pebbly road in thin-soled shoes. This may lead to a traumatic arthritis, adhesions are formed, and the pain and disability persist indefinitely until appropriate treatment is administered. The third condition, which commonly leads to metatarsalgia, is that of pes cavus, and even a slight degree of this deformity is capable of causing the greatest trouble and disability.

The treatment outlined above as applicable to cases of Morton's disease suffices to remedy the first condition. Its somewhat common occurrence should serve as an indication for prophylactic measures; and no patient, convalescent from prolonged illness, should ever be allowed to use his feet for their weight-bearing function until the muscular strength of the intrinsic muscles of the feet and of the long muscles which help to support the arches has been restored.

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The second condition is frequently amenable to manipulation under anaesthesia ; and, as already noted, this is the type of case of so-called "flat-foot" that we hear of as being "miraculously cured" by the bone-setter (see Chapter XVII.).

The consideration of the third condition is a difficult matter. In mild cases the felt pad and elastic band may prove all that is needed, but in more severe cases this is not enough. As in cases of painful flat-foot, so here, too, restoration of mobility of all the joints in the foot should be our first aim. Free manipulation is called for, and especially of the first tarso-metatarsal joint. Then every attempt should be made to secure relaxation by means of massage of any muscles that may have a tendency to spasmodic contraction. Massage should also be used for the sake of nutrition, and as an assistance to exercises, being "spaced" between them if necessary. General kneading of the foot undoubtedly helps in the somewhat mysterious process of "softening up" the foot, though the scientific description of what actually takes place is difficult. It is probable that the skin and subcutaneous tissues derive increased nutrition and elasticity therefrom, that the plantar fascia becomes more elastic, and that the short muscles not only regain their elasticity but also benefit by the revival of the power of spontaneous action, both as regards contraction and relaxation. Cupping the sole is often of great service.

In more severe cases the elastic support to the foot-pad is inadequate. A wooden sole-piece must be worn, on which the felt pad rests. Low wire loops are fitted between the toes, and through these a continuous tape is threaded to exert pressure on the dorsum of each proximal phalanx. Not only does this tend to pull the phalanges down while the pad tends to push the metatarsals up, but it also assists materially in drawing the digits into their correct alignment with their corresponding metatarsals. Even a considerable degree of hallux valgus can be remedied in this way. The apparatus does not make walking easy, and even when felt is nailed on to the edges of the wood to serve as an "upper," it is not elegant. But even if only worn about the house in the evenings, it can yet accomplish much. Capt. Patterson claims that "even tenotomy [of the extensor tendons for claw-foot] can

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usually be eliminated by [this] method of splinting," and adds that it "will not keep the patient incapacitated longer than would operative interference." "In cases of severe bunion deformities," he says, "operation may perhaps be advisable, but only for its cosmetic value. In all cases a physiological cure can be obtained and the toe straightened without operation, so that the only thing the surgeon need ever do is to remove the exostoses at the head of the bone." This may



FIG. 151.—To show position for administering resistive exercises in metatarsalgia. The patient "claws" with the toes while the hand supports the sole behind the metatarsal heads, thus helping to restore the arch from below.



FIG. 152.—Showing an alternative exercise for metatarsalgia. The patient dorsi-flexes the ankle and "claws" with the toes, the hand in this case assisting in moulding the arch from above.

sound optimistic, but when actual measurement of the length of a foot taken without weight can be shown to have increased three-quarters of an inch, it is plain that much can be accomplished.

Valuable as the means already considered may be, they must be considered solely as adjuvants. The main remedial agent is muscle-training. A start should be given with manual training. The ball of the thumb is placed on the sole of the foot in such a position that it fits exactly into the concavity formed by the

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heads of the metatarsals. If the hand is too far forward—a common fault—it will, by its pressure, cause pain. The patient is taught to “claw” with his toes while the dorsi-flexion of the ankle is secured by the masseur’s hand. In this way the arch is restored and the muscles are trained to maintain it. In this position, by attempting to “claw” with the toes, the lumbricals are brought into effective action (see Figs. 151 and 152). This exercise may alternate with a second, namely, to



FIG. 153.—Capt. James Patterson’s “foot-board.” It is made of wood, the dimensions being  $9\frac{1}{2}$  ins. by 5 ins. by 1 in.



FIG. 154.—Capt Patterson’s “foot-board” in use. The cord is held in the patient’s hands and he exerts the necessary tension. The knees are kept rigidly in full extension and the ankles in dorsi-flexion.

mould the arch with the hand placed over the dorsum of the foot so as to hold it in shape while the foot is plantar-flexed. The patient then dorsi-flexes the foot against the masseur’s resistance, maintaining the full “clawing” action while he does so.

As soon as the patient has gained elementary proficiency he may be promoted to the use of Capt. Patterson’s foot-board. This is shown in Fig. 153, and in use in Fig. 154. It serves the same purpose as the first of the exercises described above ; but it can be used by the patient without assistance, and he

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regulates his own resistance, usually far more efficiently than can the masseur, as soon as he has learnt the "trick."

The next thing to be learnt is to pick up a large marble, then a golf-ball (see Fig. 155), and finally, a tennis-ball with the foot (see Figs. 156 and 157). The ball is placed on the floor well behind the ball of the foot, and the latter is then slowly pulled backwards while the patient "claws" down upon it



FIG. 155.—The patient has picked up a golf ball with his toes.

till he succeeds in grasping it firmly enough to pick it up. It is when attempting to pick up the larger balls that the adductor transversus is brought prominently into action.

Other valuable exercises are easily devised, such as learning to balance while standing on a small football; climbing a ladder barefooted with the feet inverted, the rungs being just behind the metatarsal heads, and picking up various objects between the soles of the two feet. Free-standing exercises for patients with claw-foot tendencies should all partake of the "lunge"

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position variety. Anything that tends to stretch the tendo achillis and to push up the metatarsal arch may be used with advantage (see also Chapter XX., p. 284).

The treatment of hallux rigidus is often most disappointing. This is not to be wondered at when we remember that, even under an anæsthetic, mobility cannot be restored by sheer force. In early cases, however, an attempt may be made to help. The foot should be thoroughly heated and firm longitudinal tension should first be applied. Then full lateral mobility should be secured and, finally, any rotation which may be



FIG. 156.—To show the grip required when picking up a tennis-ball with the toes. (Cf. Fig. 157.)

possible before an attempt is made to secure dorsi-flexion. The longitudinal tension should be applied throughout and any marked reaction, shown usually by increased sensitiveness or decreased mobility, must be regarded as definite indication that we have attempted too much. Unless improvement is manifest in a few days, it is usually better to regard the case as hopeless and forthwith consider the *pros* and *cons* of operation.

Deformities of the lower extremity other than those mentioned rarely find their way into the massage-room for treatment. Occasionally a case of hysterical spasm may be found.

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If there is no obvious and very definite sign of immediate improvement, the sooner treatment by massage is abandoned the better for all concerned. Paralytic deformities call for treatment on the lines laid down respectively for that of flaccid and spastic paralysis.

Spinal deformities rarely need massage treatment at all,



FIG. 157.—A second view showing the grip required when picking up a tennis-ball with the toes.

though it may be useful occasionally to "space" a few minutes' treatment between the various exercises. The main objective is to provide a sort of general "refresher."

The treatment of torticollis and of Bell's palsy (facial paralysis) have each been considered (see pp. 337 and 317).

Paralytic deformities of the upper extremity call for treatment designed to suit the nature of the paralysis. All that

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need be said here, and that only by way of emphasis, is that on no account whatsoever should any muscle affected with a flaccid paralysis be allowed to stretch.

Other deformities owe their origin to bony deformity, to adhesions or to pathological change in the soft tissues of some sort or another. In cases of bony deformity we may be asked to make the best of a bad job, such, for instance, as training a patient to use his scapula so as to reduce to a minimum the disability caused by ankylosis of the shoulder, or we may be asked to prepare the way for operation. The former involves the prescription of exercises, possibly "spacing" in a little massage during the early stages, and using it as a means of affording relief if an error is made in attempting to push the patient along too quickly.

Only two named deformities call for special notice. These are Dupuytren's contracture and Volkman's ischaemic contracture.

Dupuytren's contracture can, I firmly believe, be prevented from causing deformity if the trouble is detected early enough, and the patient is instructed to perform for a few minutes twice daily the exercise of hands clasping and turning spaced with a little deep kneading of the palm. Otherwise, when the deformity is fully established, no physical treatment seems to be really effective. Treatment after operation should proceed on general lines.

Massage treatment is constantly recommended as a remedy for ischaemic contracture. It is a slow and tedious affair and cannot be compared in efficacy or rapidity with treatment by splintage. But there is little doubt that massage can hasten the recovery when splintage is used. It should be applied whenever the splint is altered or readjusted in any way. Great care should be taken not to allow the structures that have been kept in a state of tension by the splint to contract appreciably during the treatment. At the same time it is wise to see that flexion is fully maintained whenever the patient attends for treatment.

For other cases, the use of the cock-up splint, of the cuff-and-collar, and of the glove and tapes has been referred to in earlier chapters.

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It will be seen, therefore, that in the treatment of deformities massage plays but an accessory part at best. In this *rôle* it may be of the greatest possible service, and particularly before or just after operation. As time passes, however, its value decreases more and more rapidly, and the sooner it is supplanted altogether by exercises, the sooner the patient will recover.

A certain class of case which may have originated as a deformity or as the result of recent injury frequently finds its way into the massage-room sooner or later. This comprises the victims of cut tendons or of tenotomy. Treatment must depend entirely on what has been done and on what it is hoped may be effected. Roughly speaking, a divided tendon is joined together by fibrous tissue in about three weeks from the date of injury, and a further period of three weeks is required before this is converted into true tendon.

After accident or operation the limb is placed in position by the surgeon, and on this must depend the treatment to be meted out. Thus, if the tendon is kept by the surgeon in a position of complete relaxation, nothing may be done to move the joint upon which it acts. If, however, the position allows of movement which tends to relax the tendon still more, that movement with a return to the original position may be administered with safety. For instance, if the extensor tendon of the middle finger has been divided and the finger and wrist have been placed on a straight splint, extension of the wrist may be practised from the outset, and with this movement may be given a slight degree of flexion of the metacarpo-phalangeal joint. The inter-phalangeal joints may be moved more freely. No attempt to secure any flexion of the finger by forced movement is safe before six weeks have elapsed, though pure relaxed movement may be administered from the outset. If the patient was "put up" with the finger in full extension and the wrist in full dorsi-flexion, no movement should be given for three weeks. If a flexor tendon has been cut and the finger has been fixed in semi-flexion, it is safe forthwith to bend the finger further, provided that the wrist is flexed at the same time. Extension of the wrist should be left alone for three weeks, and thereafter the first attempts to extend it should be combined with flexion

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of the finger. No force or active movement against resistance is ever safe within the full six weeks.

If complete tenotomy has been performed in order that a tendon may be lengthened, then it is plainly our duty to perform every movement which may tend further to separate the two ends. This leads to the consideration of a natural and, so far as I know, unexplained phenomenon. Sometimes it would seem that nothing will induce the divided tendons of the hand to reunite, while nothing can prevent those of the foot from doing so. This indicates the contrast of treatment required. After tenotomy for a pes cavus or multiple hammer-toes mobilisation should be hastened with all possible speed. After suture of the tendons of the wrist we must move warily. In no class of case is skill in administering pure relaxed movement more urgently required.

Few cases, however, are more heart-breaking to deal with than those of tendon-suture when prolonged and strict immobilisation has been enforced. There is small cause for wonder in this when we remember that, during the immobilisation, not only are the united ends of the tendon joining together, but that the whole of their lateral surfaces are probably becoming equally firmly united to the tendon-sheath. Even if this does not occur, the site of suture will unite to that of the wound in the sheath no less firmly than will the sutured ends of the tendon to one another. In early relaxed movement we have the sole chance of averting these catastrophes.

## CHAPTER XXXII.

### THE COMBINATION OF MASSAGE AND SPLINTAGE IN ORTHOPÆDIC SURGERY.

THE massage treatment of the greater number of orthopædic cases has already been considered under various headings. There remains, however, one large group of cases which calls for special consideration. These cases are those in which external splintage is used as an essential part of the restorative process.

We have seen how large a part is played by massage in what may be called "medical" cases, and also that it often plays an essential part in the treatment of recent injury. But in the former it may frequently be that other treatment (*i.e.*, by mobilisation, active or passive) is only an accessory to the massage ; in the latter the mobilisation treatment is no less essential than the massage which precedes it. In fact, in certain somewhat isolated cases, the importance of the massage treatment dwindles into insignificance. So it is also in most orthopædic work. True we are sometimes called upon to treat cases which amount to nothing more or less than cases of recent injury, cases of recent arthroplasty furnish a good example, and these of course call for massage as a preliminary to mobilisation. But in much of the ordinary run of orthopædic work the place of massage gradually passes more and more into the background, compared to that occupied by mobilisation in its various forms, the chief being the active variety.

In all orthopædic work there is a common danger that a grievous fallacy may creep into the minds of the patient and of those responsible for his treatment. I have already referred to it when speaking of the use of Zander and Pendulum apparatus. The fallacy is this : The patient comes to be cured, and it only too frequently happens that the surgeon, the masseur

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and the electro-therapist alike, either by tacit consent or open declaration, tend to inspire the delusion that they, one or other or all, can effect the cure. Almost invariably the only person in whose power rests the decision between success and failure is left out of consideration. The surgeon can render cure possible, the physico-therapist can loosen, teach and train ; but without co-operation and good-will on the part of the patient the most brilliant surgery and most skilful treatment are totally unavailing. It is the patient, in these cases, who must, in the long run, cure himself ; all we have to do is to help him to effect his cure in the shortest possible time with the minimum of pain and inconvenience.

Co-operation between the surgeon and the masseur is the second essential to success. Take, for instance, the treatment of a case of a simple fracture of femur. When making the choice of a splint and while attending to its application, the surgeon should constantly bear in mind what physico-therapeutical methods he intends to employ and should act accordingly. For instance, it is useless for him to prescribe early flexion of the knee while the limb rests in a Thomas' splint if the foot-piece has been applied so as to prevent this. On the other hand, if he desires that only a few degrees of movement should be administered, the position of the foot-support is immaterial.

Then, too, during the later stages, co-operation is no less important. In cases of compound fracture of femur it is a common event for union to be greatly delayed. After weeks—more often it is a question of several months—of confinement to bed, the patient is allowed up in a walking calliper. Unless the surgeon co-operates with the masseur, recovery will be unnecessarily slow and tedious. In the first place the onset of oedema is more or less certain unless care is taken to prevent it. For (putting aside the inevitable disorganisation in the vaso-motor system of the limb, as the result of the original injury, prolonged rest, and elevation) the one great preventative agent against the formation of oedema is woefully lacking, namely, voluntary contraction of the muscles. True, intelligent training in muscular activity during the early stages will do much to counteract this tendency to inactivity on the part of

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the muscles of the limb ; yet the application of the calliper cannot but serve as a more or less inhibitory agent. Hence it comes about that, delighting in his newly-gained freedom, the patient remains "sitting up" most of the day with an occasional short walk. No amount of early training will keep the muscles in activity in the former position to an extent which will ensure that oedema shall not form sooner or later, the limb being dependent. The more it forms the less muscular activity will there be, and so a vicious circle is started. And it is folly to expect that the onset of oedema can be controlled, save only to a limited extent, by massage. True, we can help by mechanical means to assist the venous and lymphatic circulation ; and, by reflex response to mechanical stimulation, we can help in maintaining the tone of the unstriped muscles in the arterioles ; but we can only do these things for a limited space of time—say, half an hour—whereas gravity will be at work all the rest of the day, whenever the limb is dependent, opposing the venous and lymphatic circulation. Against this inimical influence continuous activity of the muscles throughout the limb can alone prove efficacious. And this, from the very nature of things, is at first impossible ; the most we can expect is spasmodic bouts of activity.

It is the surgeon's duty, therefore, to see that the patient, through ignorance, does not render the masseur's labour of no avail. He must warn the patient that the onset of oedema is certain, with all its attendant disadvantages—discomfort, inhibition of muscular activity, circulatory disturbance, slow repair, and tedious recovery—unless he is content to regain his freedom by slow stages. He must not be allowed to "sit up" all day at first ; half an hour the first day, two separate half hours the next, three the third, and then an extra quarter of an hour added on to each of the three periods every day would be a reasonable rate of progress. The patient will then be sitting up six hours a day at the end of nine days, and all the time he is not sitting up, the limb must be well elevated ; when it is dependent voluntary muscular activity must be as constant as possible. The onset of oedema is not an indication for an increase in massage : it cries for an increased dose of elevation. There is only one person who can really control this part of

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the treatment satisfactorily—the combination of rest and activity—and that is the patient himself. Let us see, then, that he understands the principle, and, whether he co-operates or not, we have done our best. Leave him in ignorance, and we cannot make the same claim. The principle underlies the treatment of every case of oedema, even of the upper extremity.

Then let us consider for a moment the final stages of treatment. The scientific manner in which the use of a walking calliper should be terminated is a matter of close co-operation. To maintain its use for a given number of days, weeks, or months, and then to discard it altogether on a stated day means one of two things: either its use has been maintained too long, or great risk attends the discarding. During the whole of the period which elapses between the day when union is sufficiently firm to allow relaxation of the extension, to some six or eight weeks prior to the day when we anticipate that the calliper may be discarded, the patient should be encouraged to perform muscle training first, and then exercises without weight. During the last few weeks that the calliper is to be worn, one, or, better still, two portions of the day should be set aside during which the patient is taught co-ordination exercises which entail a gradually increasing use of the weight-bearing function of the limb. This can most conveniently be accomplished by use of the sliding-seat, the stationary bicycle, and by re-education in walking as described in a previous chapter (see Chapter XX.). The first fortnight should see the patient advance up to the point where he "rocks to and fro" while maintaining his grip on the back of a chair. By the end of the second fortnight he should be able to take a few regular steps, or even walk across the room unaided, and the third fortnight should see a daily advance in the distance travelled and in rapidity of movement, particularly at all turning points of his progression. If all goes well we can then be reasonably certain that the patient is ready to leave off his calliper while moving on the flat by himself, and this he is allowed to do.

He is next allowed to begin ladder work for all four limbs under supervision, as a preliminary to stair-work under supervision and, finally, alone, and meanwhile the diurnal period of activity without the calliper is increased. By this time the

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patient may be considered to be safe for short periods morning and evening, walking about without a calliper, provided the ground is dry and reasonably even. He should not be allowed out in wet or slippery weather, or on rough ground, without his calliper until he is able to advance with his training up to the full use of a skipping-rope.

The advantages of this method of treatment may be summarised thus :—

- (1) The re-education in functional use is gradual.
- (2) Errors in co-ordination are corrected at the outset and the formation of bad habits, leading of course to limping, are avoided.
- (3) The gradual return of function ensures that, if union is not sufficiently firm to allow freedom in use, the defect may be recognised at the earliest possible moment.
- (4) The discarding of the calliper is thus rendered safe, or, if not, (the converse of 3).
- (5) We have a ready method of putting our opinion as to the nature of the union to the test, and of recognising that we are in error as to its solidity before any serious damage has been done.
- (6) With this sure test at our disposal it is safe to make tentative experiments in weight-bearing, at an earlier stage than is possible if we ignore the graduated restoration of function.
- (7) Individual treatment is not essential; five or six patients can be dealt with quite easily by one masseur at the same time in class.

But in all these things it is manifest that the closest co-operation is essential between all three principals : the patient, the masseur and the surgeon. And so it is throughout the whole realm of orthopædics.

If the masseur is effectively to co-operate with the surgeon, it is essential that both should fully appreciate the principles which underlie the application of *splintage*. Splints are applied to afford support to a broken bone, to limit movement at a joint, and to rest some structure or to stretch another, or possibly to effect both ends at the same time.

Whenever a patient is ordered massage, it is incumbent

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on the surgeon to explain the *raison d'être* of any form of apparatus worn. Whatever its use, however, the discarding thereof should always be controlled by principles similar to those laid down for the discarding of the walking calliper.

Thus, whenever external splintage is used to support a bone after fracture, the nature of the splints employed can be altered, the area splinted can be reduced, and the time during which the splints are worn may be altered from day to day. Take, for example, a simple fracture through the shaft of the radius and ulna in their middle thirds. The splintage first



FIG. 158.—To show how a forearm may be slung in supination while a short metal splint is still worn.

applied is shown in Fig. 79 (p. 156), and consists of a long posterior splint from hand to axilla and a shorter anterior splint. Four to seven days after fracture the anterior splint can be discarded. Almost invariably by the end of the second week the long posterior splint can be replaced by a posterior metal splint which reaches from olecranon to metacarpo-phalangeal joints. The elbow is bent to a right angle, and the bandage around the splint is attached to the patient's neck or to the sling so as to ensure that full supination is constantly maintained. A very short anterior splint may be worn for a few days if deemed advisable (see Fig. 158). Up to this point the patient has spent most of his days recumbent with the distal

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end of the splint resting on a pillow, the palm of the hand facing upwards. Now he is allowed up, sitting or walking all day, and the former position is resumed at night only. The end of the third week sees the patient free from his supinating appliance, and two days later the metal splint is replaced by one made of corrugated cardboard. This is shortened daily and made narrower on alternate days, till, by the end of the week, it is only a narrow slip, two inches broad, and the wrist is left free. About this point it may be necessary to sling the patient in pronation one day and in supination the next.



FIG. 159.—To show how a forearm may be slung in supination without the use of a splint.

Adhesive strapping may be applied for this purpose over a thin layer of wool or a bandage (to prevent it sticking to the skin) (see Fig. 159), and the use of this tension is slowly reduced day by day. From the middle or end of the third week onwards the patient is instructed as to what he may or may not do from day to day (*cf.* Chapter XI.), and the use of the sling is slowly discontinued for ever-increasing periods each day. On the faintest indication that trouble is arising, a return to the condition *in statu quo ante* is always possible, and, if gradation has been sufficiently well planned, little or no danger need be anticipated. It is well to repeat, however,

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that the danger-signals are increase of pain or tenderness, increase or reappearance of swelling, and decrease of mobility, active or passive.

Graduated decrease of splintage after fracture in the lower limb is not, however, so simple a matter, and increased freedom depends more on decreasing the time during which the limb is confined to the splint and on the use that is made of the ever-increasing periods of liberty. There are only two possible ways of decreasing the actual splintage. If the original splint passes above the knee it can be shortened so as to allow full flexion of the joint, and a movable plaster of Paris splint can always be weakened gradually for timorous patients by bending or twisting it. Moreover, a heavy splint can be replaced by one more delicately made.

The whole question of splintage must be under the control of the medical man. If the splint is applied to support a weak union, he must indicate to the masseur if he wishes the splintage to be disturbed for treatment. If this is his wish, then the fact that a splint is worn indicates that pressure or tension are liable to disturb the position of the fragments, so the utmost care must be taken during treatment to see that nothing untoward takes place. This can be ensured only if due attention is paid to the postural part of treatment already described in the section on recent injury (see Chapters XI. to XV. and XVIII.).

When a splint is applied to limit the movement of a joint, the masseur must be informed of the reason for the limitation before treatment is undertaken. Otherwise, sooner or later, attempts will be made to mobilise a knee which the surgeon is attempting to ankylose, or to leave at rest on the back-splint a knee at the one time above all others when mobilisation should be proceeding. Co-operation between surgeon and masseur is obviously imperative ; responsibility rests on the surgeon.

If a joint is to remain ankylosed, every care must be taken during treatment of the rest of the limb to see that the posture of the part is such that none of our manipulations tend in the smallest degree to disturb the stability of the joint. Moreover, if the joint is not to function, there is little or no reason why we should devote any attention to the muscles which control the movements of the joint. In the case of a knee-joint, for

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example, the quadriceps requires no special training, nothing need be done to conserve its strength. The weight of the limb is supported on buttock and heel, and we proceed with our massage for circulatory effect, with the loosening of foot and ankle joints, and with the training of the muscles that control the movements of those joints. The back-splint is bound on regardless of everything save fixation and actual freedom of circulation.

If, on the other hand, the splint has been applied to limit the movements of the joint because the quadriceps is too weak to control extension, then it is of vital importance to pay the utmost attention to the fixation of the splint, otherwise the controlling bandage will compress the muscle we hope to



FIG. 160.—To show the application of a straight posterior splint to the back of the leg so as to avoid undue pressure on the *vastus internus*.

restore unduly at one point, even though the main circulation through the limb is not obstructed. The result is that the nutrition essential to development is withheld, and the condition of weakness is perpetuated. The splint must in this case be fixed in such a way that no pressure whatever is borne by the lower fibres of the quadriceps, especially by the *vastus internus*. To ensure this, a splint much longer than is usually employed is essential. It must reach from a hand's breadth above the internal malleolus to rather less than that distance below the gluteal fold. It is firmly fixed in position by a broad band of adhesive strapping—the skin may be protected by wool or a bandage—either transversely across the patella or arranged as a figure-of-eight with the crossing at the patella (see Fig. 160). The lower end is then fixed securely

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with strapping or a bandage over a pad of wool. The lightest possible bandage, or a turn of adhesive plaster applied quite loosely at the upper end of the splint, is all that is then required to keep the splint in place. The quadriceps is thus free to perform voluntary contraction, and is subjected to no inimical pressure.

Electrical stimulation can be employed, without disturbing the splint if desired; even massage can be administered with a very fairly free hand if it is deemed inadvisable to remove the splint for treatment, and there is no interference with the circulation through any structure.

Similar principles underlie the application of splints to control the movements of other joints. Take as antithesis to the last instance a jointed leather splint, worn to prevent lateralisation of a flail elbow. The patient has two chances of ever being able to discard his splint: first by arthrodesis, and second by the adaptive shortening of triceps and brachialis anticus. Everything, therefore, that can be done to strengthen these muscles should be encouraged, everything that in any way tends to impede their development is to be avoided, and, amongst other things, anything that tends to impede the circulation through them. In other words, the upper part of the splint should be applied as loosely as possible compatible with stability, and that is saying a good deal. A loose funnel is required rather than a glove-like-fitting case.

When splints are applied to control movements at a false joint, caused by non-union after fracture, the greatest care possible is essential when devising and applying them. To effect union an efficient blood-supply is the one essential. Let us beware, therefore, when arranging our splintage that we do nothing to impede the circulation.

Occasionally splints are applied to limit the movement of a joint so as to allow more readily the healing of some other structure. The danger which underlies this method of treatment is that the structure will suffer renewal of injury when mobility is once more allowed. It is wise, therefore, in these cases to treat the patient as one who is suffering from recent injury or an open wound, and to secure some freedom of movement every day.

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The principle underlying the application of splintage in order to rest a weakened muscle is a triple one. First, the weak muscle must be free from all strain or tension when in a condition of relaxation. This does not mean that if an extensor is affected the joint controlled by the muscle must be put up in full extension, or, conversely, if a flexion is weak that no degree of extension is allowed. As a general guide we may take it that no inimical strain will be laid upon any muscle provided that splintage is so applied that movement can take place only through the inner third of the range of possible movement.

This leads at once to the second principle, namely, that the application of the splintage must be devised so that the weakened muscle may have perfect freedom for its activities when power is returning.

Third, the action of the antagonist must be limited. It is quite wrong to imagine that all action in the antagonistic muscles is inimical and must therefore be inhibited altogether. Far otherwise, indeed, for this would usually mean complete immobilisation, one of the great agencies by which we can lower the blood-supply to the part and so withhold from the weakened muscle the thing essential to recovery. Our aim, therefore, should be so to arrange the splintage that antagonistic movement can take place, but is limited to one-third (perhaps even to one-half) of the full range possible; while the muscles, which we hope to strengthen, are free to act through the inner third (or half) of the range of movement.

Let us see how these principles are applied to two common splints, namely, the shoulder abduction splint and the long cock-up splint. If the arm is abducted beyond  $45^{\circ}$  to  $60^{\circ}$  from the side, the strain on the deltoid is negligible when it is at rest and completely relaxed, and given suitable circumstances, *e.g.*, when fully recumbent or when using a weight and pulley, the adductors are free to act throughout the outer half of the range of movement, and the abductors throughout the inner half. But these activities are possible only if the limb is not anchored to the splint, as, for example, by the sleeve of a coat or jacket. When this is done we ensure that any effort on the part of the muscles shall result in unproductive labour,

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truly a strong impediment. If, however, the limb is free to move on the splint, *i.e.*, if it is applied over the jacket-sleeve, then there is every inducement for the deltoid to activate at constant intervals, and not only at those rare stated times when the sleeve is removed for set exercise.

Unintelligent use of the long cock-up splint for posterior interosseous paralysis is fraught with disaster. It can be transformed into one of the most crippling agencies. To be used aright it should maintain the wrist, not in full dorsiflexion, but in about the position usually adopted when writing.



FIG. 161.—A short cock-up splint applied so as to exert as little obstruction as possible to the return of the blood in the veins on the back of the hand.

The metacarpo-phalangeal joints should rest at an angle of about  $45^{\circ}$  from the straight and, to be strictly accurate, it is probable that both inter-phalangeal joints should be perfectly free from the splint. The thumb should rest in a position of abduction and extension, and in such a plane that simple flexion of all its joints and of the little finger would suffice to bring the tips of the two digits into contact with each other. That is to say, it should be maintained in a position of opposition. Under no circumstances, save only in the presence of some such complication as ischaemic contracture of the flexor tendons, would any part of the hand distal to the metacarpo-phalangeal joints be attached to the splint. Moreover, the

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proximal part of the splint should be fixed as lightly as possible. Great care also should be taken to ensure that the fixing material—be it bandage or strapping—does not cross the back of the wrist transversely. If it does so, there is a grave risk of obstructing the venous return from the fingers. The best plan is to fix the splint by means of strapping, which is adherent to the angle of the splint and then passes obliquely across the back of the wrist and returns to the splint, having thus formed a complete figure-of-eight (see Fig. 161). This arrangement allows a freedom of movement of the long extensor muscles of the wrist within the inner half of the range of movement, and, if the inter-phalangeal joints are free, allows a considerable freedom of use to the hand.

Whenever a splint is used to rest a weakened muscle the principles which underlie its application must be respected during treatment. Thus, if a patient is wearing an abduction splint to rest a weakened deltoid, free abduction from the horizontal upwards to the vertical and full rotation may be administered, either by the masseur or by the aid of apparatus, *e.g.*, the overhead weight and pulley. If the splint supports the arm more or less in the horizontal plane, then the limb should not be lowered below this level while the patient is sitting or standing. When he is recumbent, however, the weight of the limb is no longer liable to be supported by the deltoid, and so, theoretically, a greater degree of movement may be allowed in this position. In practice, however, the necessity rarely arises and, should it do so, care should be taken to see that during adduction the head of the humerus is not drawn downwards in the glenoid, but is rather pushed well home in an upward direction.

So, too, when treating a patient who wears a cock-up splint, there is little or no chance of overstretching any of the long extensor muscles, provided the hand is kept in full supination when unsupported. When in pronation, however, every care must be taken not to lower the hand beyond the straight line. This is not intended to imply that a few extra degrees of flexion would injure the extensors, even were they completely paralysed. The point really is this: For the purposes of treatment—massage, loosening, re-education—no movement

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beyond the straight line is essential, and there is certainly a point not very far removed from this position where injury to the muscles would ensue if the hand were allowed to rest there for any considerable length of time. Further on, in palmar-flexion, there is doubtless a point to which even momentary movement would inflict injury. We have nothing to guide us as to where either of these points may be, so it is imperative to take no risks. The limit fixed must therefore be arbitrary, and that suggested above allows a greater freedom



FIG. 162.—To show how the opponens pollicis can be prevented from stretching by the application of adhesive plaster. If desired the nail need not be covered, as the plaster can be split and made to encircle the distal phalanx.

than many physico-therapists will grant. One more detail, often overlooked, and yet of ever-increasing importance as greater freedom in treatment becomes permissible: full flexion at the metacarpo-phalangeal joints (and probably at the more distal joints as well), should be administered in full dorsi-flexion of the wrist only; no flexion should be allowed at these joints when the wrist has been lowered to a straight line.

The punctilious care with which adequate support is provided for a dropped wrist, a dropped ankle, or a paralysed deltoid is altogether laudable. No less, however, do other

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paralysed muscles need similar treatment if their recovery is to be expedited or even allowed to take place. Beyond all question the most important individual muscle in the upper extremity is the *opponens pollicis*, and yet in respect of treatment by rest it is probably the most neglected. All that is required is a loop of adhesive strapping placed round the thumb, the other end passing over the ulnar border of the hand (see Fig. 162). So, too, in cases of paralysis of the posterior tibial nerve it is rare to find precautions taken to rest either the transverse adductor or the lumbricals. Yet, should these fail to recover, metatarsalgia is inevitable. If applied early enough, a strip of adhesive plaster placed around the foot behind the heads of the metatarsals (after these have been well moulded into position), is often adequate. Hyperextension at the metatarso-phalangeal joints is well-nigh impossible while the anterior metatarsal arch is fully maintained—though why this should be I do not know.

Probably the form of splint for a paralysed muscle which most closely approximates to the ideal is the toe-elevating spring for external popliteal paralysis, especially if the spring is arranged so as to exert an inverting influence on the foot. It allows, but limits, the freedom of action in the antagonists; it saves weakened muscles from overstretching while, at the same time, allowing them freedom for activity when power is returning. But even so it is not perfect, as the spring will not replace the *tibialis anticus* in so far as it is concerned with the support of the longitudinal arch of the foot. So we have to beware lest this tends to give way, and, if it does, we have to be content with a far from ideal device, namely, a valgus T-strap attached round the outside iron.

When we consider the possibilities of applying a similar device to a hand after section of the ulnar nerve, it is easy to understand why splintage for this condition is so often unsatisfactory, and why we are so often faced with the necessity of restoring the resulting deformity. In the first place, a loop of strapping passing over the dorsum of the proximal phalanx and fixed to the palm should serve to prevent the last 45° of extension of the metacarpo-phalangeal joints. Then a light splint should be attached to the dorsum of the proximal

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phalanx, and from this a jury-mast should project in a straight line, carrying from its extremity a loop which should prevent flexion of the two distal joints beyond about  $30^{\circ}$ . Even this arrangement ignores the paralytic condition of many other muscles, and would entail the manufacture of such a flimsy affair, that, in practice, the ideal is unattainable. The only makeshift possible is to employ either an anterior or a posterior splint with one bend in it opposite the metacarpo-phalangeal joints, which will keep these joints bent to about  $60^{\circ}$ . The



FIG. 163.—A posterior plaster splint which inhibits over-action of all the extensors while allowing perfect freedom of action to the flexors of the fingers.

two distal joints will then remain approximately straight (see Fig. 164).

When, however, deformity is present, and we wish by splintage to exert a constant tension, which shall stretch the offending structures responsible for the deformity or for any impediment in movement, the principles involved vary only in one detail. This is that all movement in the opposite direction to that which we are trying to enforce shall be absolutely cut off. But, on the other hand, it is of immense importance, whenever possible, to ensure freedom of action for the muscles that control the movement which is lacking.

Thus the cuff-and-collar principle is nearly ideal (see Fig. 76, p. 150). It would be quite so were the tension exerted not so entirely dependent on the position of the shoulder which

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FIG. 164.—A posterior plaster splint which only inhibits over-action of the extensors of the metacarpo-phalangeal joints. There is a tendency for this splint to "rest" the interossei as well. In practice, when these muscles are paralysed, the interphalangeal joints remain extended when the proximal joints are flexed and the long flexors are also at rest. The latter are, of course, free to act; but, on relaxing, the fingers tend to straighten when this splint is applied. If, on the other hand, the interossei are paralysed and the metacarpo-phalangeal joints are free to extend, flexion deformity at the interphalangeal joints is inevitable.

remains mobile. Adduction across the front of the trunk loosens the tension, abduction tightens it. Tension on the fingers by means of tapes is another good example of this method of treatment, but the disadvantage of the pattern



Back view.



Front view.

FIG. 165. To show the application of a thumb abduction splint. Note that the splint is applied with the first metacarpal in opposition. The distal phalanx of the thumb is usually left free.

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shown in Fig. 96 (p. 208) is that it is unduly painful owing to pressure on the back of the joints involved. As a preliminary to securing flexion in rigid fingers by means of splintage and tapes, tension in the longitudinal direction is most desirable. This tends to overcome adaptive shortening in the lateral ligaments of the joints, which is one of the main causes of impediment to movement. Sometimes the hand is placed in a plaster cock-up splint and adhesive strapping applied to the fingers. In this case the strapping should be confined to the



FIG. 166.—Capt. Verrall's supinating (or pronating) plaster of Paris splint.

distal phalanges. The disadvantage is that it may slip, and the tension on the tapes tends to pull the splint forward into the palm of the hand. To be successful the palm piece must never pass the middle cross-line of the palm. For these reasons I devised the use of a posterior plaster splint (see Figs. 163 and 164). This is ideal in principle, but is dependent for its action solely on the activities of the flexor muscles. Both splints illustrated satisfactorily impede the action of the extensors, but fail when anything but a very small degree of pressure is required, as the position of the palm of the hand is so difficult to control.

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A splint of similar construction was devised by, I believe, Capt. Teece at Shepherd's Bush. In cases of fixed adduction of the thumb he inserted a plaster splint over the web between the thumb and the index finger (see Fig. 165). Abduction was in no way restricted. The splint was replaced as the shortened structures stretched.

A splint which satisfies the main principles is that for rotation of the forearm devised by Capt. Verrall (see Fig. 166), while the "drop-heel-plaster" splint—a walking plaster in which the heel is supported only on a pad, while the fore part of the foot rests upon the splint—illustrates another type of "tension" splint, the tension now being one that is very constantly repeated, and intermittent—but not constant.

It might be thought that in using splints of this type recovery could be anticipated regardless of the good-will and co-operation of the patient. To a certain extent this is so. But two things are sure: first, that the patient who diligently does all in his power to assist his treatment by constant voluntary contraction of the muscles, which control the movement that is lacking, will improve vastly more rapidly than he who merely relies on his splint; and second, without the co-operation of the patient, relapse is almost certain.

Relapse is sometimes not entirely the fault of the patient; it is sometimes due, once more, to disregard of an important principle in treatment. This is that the use of the splint must not be abandoned too rapidly. For instance, it is an error to suppose that it is always within the patient's power to retain the full flexion of his fingers, if the splint which has secured it is discarded suddenly. In a certain percentage of cases, fingers which have been flexed by the aid of splintage will steadily stiffen again into full extension. So, too, I have seen a typical ulnar deformity corrected by splintage and relapse in spite, I believe, of strenuous effort on the part of the patient to prevent it. The secret of success is to reduce the time that the splint is worn day by day. Thus finger-tapes may be left undone half an hour the first day, two periods of half an hour the second, and three the third day. Then a quarter of an hour is added every day to each period of freedom till, finally, the splint is worn only at night. Then, too, the nature of the splintage can be

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changed by substituting strapping over felt, and finally by tying up the fist in a handkerchief.

But whatever splint is worn the patient should receive treatment daily, and this for two reasons. First, it is essential that, as far as possible, movement should be maintained intact in the direction opposed to that in which the splintage is working ; and, second, the muscles which control this movement should be given their full chance of voluntary exercise. Failing these things, function is almost sure to deteriorate greatly while the splint is worn, even though, as is far from likely, mobility has increased. But the masseur must use every care to ensure that the fixation after treatment is at least identical with that before he loosened the apparatus ; and he must realise that any day on which he fails to secure some advance—no matter how slight—indicates a day's treatment to no purpose. On the other hand, there is a limit to human endurance, and if the tension or pressure is too great, few patients will endure undue pain when relief follows the easing of a knot ! Moreover, if we exert sufficient force to give a sleepless night, the chances are that there will be a reaction next day which will inhibit rather than further progress. At the same time, he who *never* overdoes it, rarely does enough !

Two final points. Whenever splintage is being used as a means for coercion, it is inevitable that there should be pressure. It is the masseur's duty to see that the pressure is as evenly distributed as possible, and that all points where the main pressure falls are adequately protected. Second, pressure always interferes with circulation to a greater or less degree. The masseur must see to it that circulation is at least adequate after he has refixed the appliance. In all these things, what may be quite satisfactory now, may be the very reverse in a few hours' time.

Occasionally a surgeon moves a joint forcibly from a bad position to a good one, tearing down all impediments, and fixes it in plaster. The reaction is usually great, and physico-therapeutical treatment is impracticable till the splint is released. Then, unless indeed treatment is withheld until the joint becomes more or less fixed in its new position, recurrence is almost certain unless the splintage is released by gradual

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stages. Day by day the mobility of the joint is restored by a combination of relaxed movement and muscle training, and the splint is replaced in position. Then the splint is discarded for slowly increasing periods each day in the manner already indicated. The same treatment should be supplied whenever an increase in mobility has been secured by means of any of the splints that depend for their efficiency on the use of screws, *e.g.*, the Turner knee-splint. To screw up a joint in a plaster splint to a certain point, discard the splint altogether during a period devoted to physico-therapy, and then replace the splint for further screwing represents a faulty principle. If, for any reason, the screw-splint has to be removed for a time, the interim should, of course, be occupied by physico-therapy, but a temporary removable splint should be worn which prevents as far as possible all tendency to relapse.

## CHAPTER XXXIII.

### MASSAGE AS A REMEDY IN THE TREATMENT OF THE WOUNDED.

IT is often said that we have much to learn from war injuries from the purely massage point of view. As a matter of fact, not very many new discoveries have been made in the massage world during the last five years. The chief difference between military and civilian practice is this, that the conditions we used to regard as exceptional we are now called upon to treat in overwhelming numbers.

In pre-war days we were often inclined to think that two or three months of treatment was all that any individual had a right to expect, and that if he did not recover in six months the patient was either incurable or had at least received all the treatment to which he was entitled. Now we know that many of our patients cannot possibly recover in less than eighteen months or two years, or even more ; and, knowing our indebtedness to the wounded, we face the prospect of prolonged treatment with equanimity.

In other words, we are learning, more fully than ever before, the one great secret of massage treatment—patience. Let us hope that the lesson thus learnt will incline us to patience with the less fortunate of civilians who also require prolonged treatment.

Another thing that is new to many masseurs is to be brought into such intimate contact with the results of sepsis, and many have been the unpleasant surprises when infection has been lighted up afresh by over-vigorous treatment. Sometimes this is administered without due appreciation of the danger, sometimes merely from lack of patience. No means has yet been discovered of hastening the absorption of the pathological products which cripple the patient for so long a time after sepsis has intervened. Nature alone can repair an injury, and that through the circulation. The whirlpool bath

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owes its success to the fact that, in its use, no attempt is made to confine treatment to the injured part. Thus, if a hand is stiff and rigid, the whole limb up to a point well above the elbow is immersed in the bath. Had masseurs realised the truth of Lucas-Championnière's teaching, these baths would not have gained their reputation so readily. The secret of their success is that the whole limb is treated. Lucas-Championnière always taught that the important thing to remember when administering massage is to treat the whole limb, and that the injured part is the last that should receive attention. When a patient whose hand and fingers are rigid has received massage treatment for his hand alone, the whirlpool bath will hasten recovery in a remarkable manner. When, however, a patient with similar disability has received systematic massage of arm and forearm as well as of wrist and hand, the addition of the whirlpool bath to his daily treatment makes little or no perceptible difference to progress, except in so far as they impart warmth to the limb. A few cases—particularly those with returning sensation who suffer considerable pain—undoubtedly do better with the bath than with massage. These are, however, exceptional. The baths as a rule require little supervision and no labour, and therein they score. When sensation has been impaired by nerve injury all baths require the closest supervision, or severe burns, most intractable in nature, will be inflicted.

The mechanical can rarely, if ever, equal the human agent in any form of remedial work, and so let us beware lest we ask of the baths more than we can reasonably expect. At the same time, let us take their lesson once more to heart, and remember to treat the whole of every limb that has been injured, and not only just the injured part itself. Thereby we can ensure that the injured part will receive a vascular supply adequate for its repair; without this, local treatment is obviously useless, and may even be detrimental. Of what is "treatment" to consist? Once more, in spite of repetition, it is well to emphasise that normal function can do more to restore nutrition than can massage. Every activity that is possible, therefore, within the limits of safety should invariably be prescribed throughout the whole limb.

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Whenever there is tissue to be stretched, the very stretching is synonymous with injury. Efficient blood supply and lymphatic circulation are essential for repair, and, in their absence, any injury, however trifling, cannot be made good. It is thus that so many patients travel steadily down the hill in response to too vigorous local treatment.

A patient who wears a splint attached below the elbow should be taught throughout the day freely to exercise shoulder and elbow. If he is not told to do so he will leave the whole limb lifeless and at rest, and the masseur will have missed one of the greatest opportunities he has of hastening recovery.

Massage in war-time should also bring home to all masseurs the truth that underlies Lucas-Championnière's whole teaching of treatment by mobilisation. "Movement is life" was the axiom underlying all his work, and, if we wish to restore the maimed finger as rapidly as possible, we must exercise shoulder and elbow to the full; if the shoulder is stiff, let us hasten its repair by prescribing the full exercise for hand, wrist, and elbow.

Also we must not lose sight of the fact that sepsis is a very debilitating affair at best. This was forced home by the observation of the progress of two brother officers who were in a big railway "smash" in France. Both were strong and healthy men in the pink of condition, and both suffered comminuted fractures of tibia and fibula in both legs at the junction of the middle and lower thirds. One got pneumonia—only a slight attack; the other had no complication. At one point in the treatment of these two patients, the former was in bed with one leg fairly firm and the other quite "wobbly." The officer who escaped the pneumococcus had been walking about for three weeks. Here, then, is an example of the way in which sepsis can hinder repair.

The moral is plain. It is our duty to do all in our power to build up the general strength of our patients, and to this end we must encourage them to take all the regular exercise that lies in their power. A gymnastic class can well be taken, even though every man has his arm in a sling. Few are injured so severely that they cannot perform some educational exercise with advantage.

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Volumes could be written on the subject—"Tommy: A psychical study." The outlook on life varies between the two following examples. "'Eart-breaking work for you, sister, ain't it, trying to get us fellows well, when none of us mean to be fit again till the war is over!" represents one extreme of thought; while the other limit was reached by the man who, having been on the top of the Vimy ridge for months, was invalidated home as "G. S. W. femur, septic." In spite of two inches shortening and two plugs, so great was his desire to be with "the boys" when they charged down the slope of the ridge, that, hoping to hasten his recovery, he refractured his femur by abuse of freedom when first allowed out of bed.

"*Shell-shock*" is a phrase that has caught the public eye as something quite new. The only novelty about it is perhaps that, as Farquhar Buzzard has pointed out,<sup>1</sup> it is rare to find in the whole realm of medicine and surgery any term that covers such a multitude of various conditions—unless, indeed, it is "railway-spine." Grouped together under this heading we find every variety of case from the pure malingerer to cases of severe head or spinal injuries—from the insane to the man who was "fed up" and wanted a week or so in "Blighty."

Buzzard classes "shell-shock" cases more or less into the following groups:—

First, "cases of pure exhaustion"—*i.e.*, men whose natural reserve of nervous energy is limited, and who therefore soon show symptoms of the lowering of the amount of nervous potential that is available for the use of the organism. These patients are pure neurasthenics and should be treated as such.

The second class contains those "who have inherited neuropathic or psychopathic tendencies, and in whom the process of exhaustion has excited these dormant tendencies into activity." This is simply expressing in other words the fact that psychasthenic soil is a fertile one on which the plant of neurasthenia flourishes. They require treatment as for neurasthenia, until this element of the combined disorder has been obliterated. The psychasthenic element can, of course, only be dealt with adequately by psychical treatment.

<sup>1</sup> *Lancet*, December 30, 1916.

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The third group is described as consisting of "martial misfits," and consists of a limited number of men who, by temperament, training, or both, are totally unfit for military duty. They undertake the duty with this knowledge, realising all the time that the road they are treading leads to inevitable "smash." When this arrives they are simply victims of neurasthenia, the fatigue in this instance being due in the main to the incessant outrage inflicted on the unconscious mind *via* the conscious.

The fourth group consists of men who have suffered actual concussion. Recovery may be apparently rapid, but in reality no one ever makes "rapid" progress after any severe head injury. It always leaves its echo, as it were, behind; and unless sufficient rest is enforced (Buzzard puts it at four weeks in bed at least), the patient almost invariably exhibits some signs of neurasthenia.

The fifth group, unfortunately not a small one, comprises cases which are dubbed as "shell-shock," but which in reality are suffering from some organic (and not psychical) lesion of the central nervous system. Each calls for treatment suitable to the symptoms produced by the lesion.

The sixth group consists of hysterical cases, "who suffer from so-called functional paralysis, anæsthesia, mutism, aphonia, deafness, blindness, etc." Reference to the chapter on *Neurasthenia* will show that massage treatment is not extolled as a remedy for these cases. They are not malingeringers; they are men whose personal consciousness has contracted. They therefore require psychical treatment, not physical.

The seventh group consists of malingeringers pure and simple. Of these Buzzard says, "My belief in the general honesty of the human mind leads me to the conclusion that such persons are extremely rare." Many surgeons will dissent from this opinion, but the physician is the more competent judge of this type of case. Massage for the malingerer is obviously waste of time.

When "shell-shock" is thus reduced to its component parts it becomes evident that this is no new disease created by warfare. Given accuracy in diagnosis, we are only confronted with conditions with which we are quite familiar decked out

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under a new title. Perhaps it is as well, for it is preferable that the public should regard most of these poor fellows as "shell-shock" cases rather than as suffering from hysteria and neurasthenia. But this analysis of "shell-shock" cases serves once more to emphasise that we should as a rule extend to the victims of neurasthenia not only our sympathy, but also our admiration for the magnificent fight put up, with insufficient strength against overwhelming odds, before they are finally crushed.

As the result of war injuries we are called upon to deal with a very large number of amputation cases. There is nothing particularly new about their treatment ; each case has to be considered on its merits and dealt with accordingly.

In one type, the scar is adherent and requires loosening. In another, some nerve is caught in the scar and requires to be shaken loose. If pain is due to a bulbous end, vibrations may suffice to cure, as also if the nerve is bound down by adhesions.

We may only require to restore nutrition ; but usually, whatever else there may be to do, some structures will need stretching. Whenever this is so, the case should be dealt with by gradual tension of the contracted structures while kneading, shaking, or vibration is performed. It is a tedious and tiring job, as considerable physical strength is required, and progress is seldom rapid. It is frequently possible to hasten it, however, by the prescription of suitable exercises. There are few of these cases for which some form of active exercise cannot be devised—in addition to the administration of assistive and resistive exercises. In one type, however, this is practically impossible, namely, after amputation through the upper third of the thigh. These cases are very difficult to deal with, when the problem is to restore extension and adduction. The strain on the masseur's wrists is very great, as the effort required varies in direct proportion with the shortness of the stump. It is almost essential for two people to work together : one holds the thigh of the sound limb fully flexed upon the abdomen so as to immobilise the pelvis, while the other performs the manipulations. So great is the strain, and so much physical exertion has to be expended,

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that very few cases can be dealt with daily by any pair of masseurs.

To overcome the difficulty we have given trial to many devices at the Special Surgical Hospital at Shepherd's Bush. At last we have hit on a plan which bids fair to yield success. My two masseurs, Sergeant-Major Pavitt and the blind masseur,



FIG. 167.—The table and apparatus in use at the Special Surgical Hospital for stretching thigh amputation cases with flexion deformity.

the late Mr. N. Webb, first gave it trial. It has proved most successful, and they, with our carpenter, A. J. Hobbs, have made a notable advance in our treatment of these very difficult cases.

Two parallel slits are cut in the top of the massage-plinth, and through these a horse-girth is passed which surrounds the stump. The ends of the girth are attached to a lever which can be depressed by the foot. This is also controlled by a

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spring. One masseur then flexes the sound thigh to its full extent, while the other exerts tension on the stump by pressing down the lever with his foot. Both his hands are thus free to knead the tightened structures. The adduction is secured manually, and also by altering the position of the patient's pelvis and by lateral pressure (see Fig. 167 and Appendix). The use of this table can be extended to many other conditions, and notably to that in which full extension of the knee is restricted. During the application of the tension the patient should use his own muscles as far as possible in order to assist in securing the movement desired.

Throughout the pages of this book repeated reference has been made to the use of "exercises," and it has been said that nothing can replace the ordinary use of a limb as a remedial agent. No reference to treatment by exercises can therefore be considered complete unless it includes work done in the remedial workshops now arranged in connection with many of the hospitals for the wounded. Here the remedial agent is productive work which entails general use. Thus not only are muscular strength and co-ordination re-developed, but the psychical effect on the patient is of the greatest value. The work referred to is designed for the restoration of function and is quite distinct from occupational re-education, which, however, is no less important to many of the disabled. To H.M. King Manuel our wounded owe a debt of gratitude for his ceaseless labour in this branch of remedial work, which he has made so specially his own.

## CHAPTER XXXIV.

### RE-EDUCATION OF AMPUTATION CASES.

WHEN St. Thomas's Hospital ceased to be also the 5th London General War Hospital, it was decided that our clinic for the treatment of the wounded should be replaced by a fitting hospital for those who had suffered amputation. It became necessary, therefore, to try to find out how far it was possible to help patients to learn the use of an artificial limb. During the preliminary investigations, I was struck by the fact that all patients with an above-knee amputation had a more or less stereotyped limp, which seemed to me to be familiar. It was only after long and careful study that I discovered what it was of which this limp reminded me. I think there is no question that if we could imagine a tabetic to be ataxic on one side of the body only, that his gait would correspond very largely to that of a patient with an above-knee amputation, who is wearing an artificial limb, and which he has not learnt to use properly. The next consideration that arose was this :—The blind tabetic is never ataxic, except in the very latest stages of his illness. If it is possible for the blind man to call upon senses other than those comprised under the heading of joint and muscle senses, so as to maintain his co-ordination, is it not possible to train the sensations in a stump, so as to teach the patient co-ordination even in a lifeless limb ?

From this small beginning there has developed a regular technique for re-education which has, I believe, proved of the utmost service.

Treatment, roughly speaking, may be divided into three main parts. Perfection of co-ordination in every muscle which has been left intact is the first consideration. The second is to educate sensation—tactile, muscular and joint—throughout the remaining portion of the limb, and the third to combine the first two so that the patient shall be able to perform definite and even complicated precision exercises.

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Some patients seem to take to their artificial limbs without difficulty, and these require but little training. They learn to use the limb by the light of nature. Others do not, and these patients are in sore need of help. Explanation must be given of what is wrong and what it is desired to effect, and even definite anatomy lessons may be required.. A short lecture on co-ordination is also not out of place.

Perhaps one of the most important things in the training is the re-education of joint and muscle sense, and education up to the highest pitch of perfection of the tactile sense.

When we consider that most lower limb amputation cases go about on crutches for a considerable period before they are fitted with an artificial limb at all, it is at once obvious that the intimate co-ordination in movement which exists between the two sides of the back is disturbed. Add to this that there is a constant tendency, when using crutches, to jerk the stump forward by contraction of the psoas, while the gluteus maximus remains almost functionless, and we see at once the possibility that a lamentable error in co-ordination may be established. The gluteus maximus also seems to waste more rapidly owing to a lack of function than does the psoas ; and so, not only is the co-ordination of movement disturbed, but the relative balance of strength between the flexor and extensor of the hip is upset. The first step in training, therefore, should consist of general trunk exercises, designed to restore co-ordination between all the trunk muscles, not only of the back, but also of the abdomen. Every attempt must also be made to build up the strength of the gluteus maximus on the affected side by exercises, and, if necessary, by means of graduated faradic contraction. The main points in training of the muscles of the hip are to teach the gluteus maximus to act more strongly and more quickly, and the psoas less vigorously and by gradual contraction, as distinct from the sudden jerk. Attention must also be paid to the adductors, to ensure that when the patient first gets into his bucket he does not simply allow his stump to flop outwards into abduction. If he does so, the outer portion of the lower end of his bony stump presses on the outer side of the bucket, while the region of the adductors is pressed upon the rim. This is the invariable tendency, and one that must

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be eliminated by training if the patient is to use his limb properly.

When the patient first appears with his limb fitted, his attention must at once be drawn to this danger, and he must be taught to use his adductors in the standing position, so that the portion of the bone which is left assumes, within his bucket, a position which corresponds with that of the upper portion of the bone on the sound side. It must be remembered that in life the femur does not rest in the vertical position while standing. It has a marked inclination inwards, and, unless the patient learns to correct the alignment of his bone within his bucket, he will never learn to use his limb properly.

The next thing which he has to learn is to swing his limb forward and backwards with perfect rhythm, as already described in the chapter on the re-education in walking. The uninstructed patient always tends to jerk his stump forward far more vigorously than is actually required to secure full extension of the knee-joint at the end of the forward swing. He must learn to swing forward at the slowest pace which is compatible with bringing the heel down on to the ground after extension. He will never learn to do this with success unless he has regained perfect control over his gluteus maximus. The next stage is to teach the patient to rock to and fro, as already described in the former chapter. In order to keep the knee locked while transferring the body-weight forward, the gluteus maximus must be taught to act in unison with the adductors, thus bracing the stump back firmly throughout the whole of the forward step of the sound foot against the postero-internal aspect of the bucket.

As soon as he has learned to rock to and fro with the aid of two sticks, he is taught to do so with the aid of one only, and at this stage, if not before, it is wise that he should study his own movements in a full-length mirror. In this way he can be shown that he must not drop the shoulder on the side of his amputation while walking, and that he must not, so to speak, tend to sink into his bucket by faulty co-ordination between the back and abdominal muscles on the two sides. As soon as co-ordination while using a stick has been mastered, the patient is taught to practise the same routine while carrying his stick in his two hands in front of him. The tendency to the dropping

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of the shoulder and sinking into the bucket having been eradicated, the patient is taught to combine the natural swing of the arms with the ordinary movements of the legs while walking.

All this time the patient is encouraged to take very short steps, the heel being brought down to the ground very little, if any, in advance of the toe of the other foot. He is then allowed to increase the length of his stride. About this point regular drill should begin to the word of command. He should be taught to step off and to halt ; to turn sharply to the right or to the left as if on parade, and then the command "right about face" can be given.

Balance exercises now take a prominent place in the treatment. Any of the ordinary trunk exercises in a standing position may be prescribed, together with combined trunk and leg movements, especially in the lunge position. It is almost essential that slopes of various gradients should be laid out, and the patient shown how important it is to take short steps with his artificial limb going uphill, and long steps going down-hill. As soon as he has become fairly expert in manipulating these, he should be taught to walk over a loose plank, and to negotiate climbing over a stile. Rapidity of movement should be prohibited at least until this stage is reached. Almost every form of Swedish gymnastic apparatus can be utilised as well for the man with an above-knee amputation as for the man with two limbs. Jumping up and down on the bars, for instance, is an invaluable precision exercise. Throughout training, and indeed at every stage of training, once the patient has been taught to accomplish any particular prescription satisfactorily with his eyes open, he must be taught to do the same with his eyes closed. This is one of the essentials of treatment, and applies even to the jumping up and down on the bars. Every patient should practise kneeling down and getting up again, and various trunk movements whilst kneeling. He should learn to ride a bicycle, mounting and dismounting being practised until it is perfected. Walking upstairs, one foot before the other, and climbing ladders are by no means impossible feats for a patient who has only six inches of femur left. I do not yet know how long a stump is essential whilst wearing an artificial leg to sit a horse in comfort.

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Very little ingenuity is required to devise many appropriate and useful exercises. The use of a scooter and the swinging of a golf club may be encouraged fairly early, while more advanced forms of exercise, such as playing tennis or squash rackets, should, of course, be prescribed very late in the treatment. As a means of perfecting co-ordination few things, perhaps, can equal dancing lessons, and no amputation below four inches from the top of the great trochanter should be considered as debarring a man from following almost any occupation or pastime to which he has previously been accustomed. He should be able to wear his limb all day in comfort, and, even with a 4-inch stump, be able to enjoy a day's shooting on heavy ground. The one essential, of course, is that the patient should be fitted with a strong and a light limb. The more the lever arm is shortened, the more essential does this become, but even with below-knee amputations the wearing of an unnecessarily heavy limb is inflicting on the patient an unnecessary exertion. For these patients, where weight may be of minor importance, it is, none the less, inflicting a very serious handicap to compel the patient to wear a heavier limb than is absolutely necessary. In above-knee amputations, to fit an unnecessarily heavy limb is to impose a burden which will act as a serious handicap throughout life. The lighter the limb, compatible with strength, the better. It has been pitiable, on many occasions, to see the joy and delight of a patient who has been accustomed to use a limb weighing eight or nine pounds to find himself the proud possessor of one weighing four and a half. On more than one occasion this alteration has brought the unsolicited testimonial that the reduction of weight has caused a complete change in the outlook on life.

It is impossible in a short space to do more than give a bare outline of the training of these patients. Some require little or none, others call for prolonged care and the exercise of consummate skill. Details have to be worked out for each patient's individual requirements, and I hope enough has been said to indicate the main lines which should be followed.

Cases of below-knee amputation rarely require any special training, and I have made no attempt to study the treatment of upper limb amputations. A very special know-

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ledge of various arts and crafts is essential, and this I do not possess. Capt. Maxwell's work in this direction is too well known and appreciated to need mention here, but I cannot refrain from this passing tribute of admiration for his work.

## APPENDIX I.

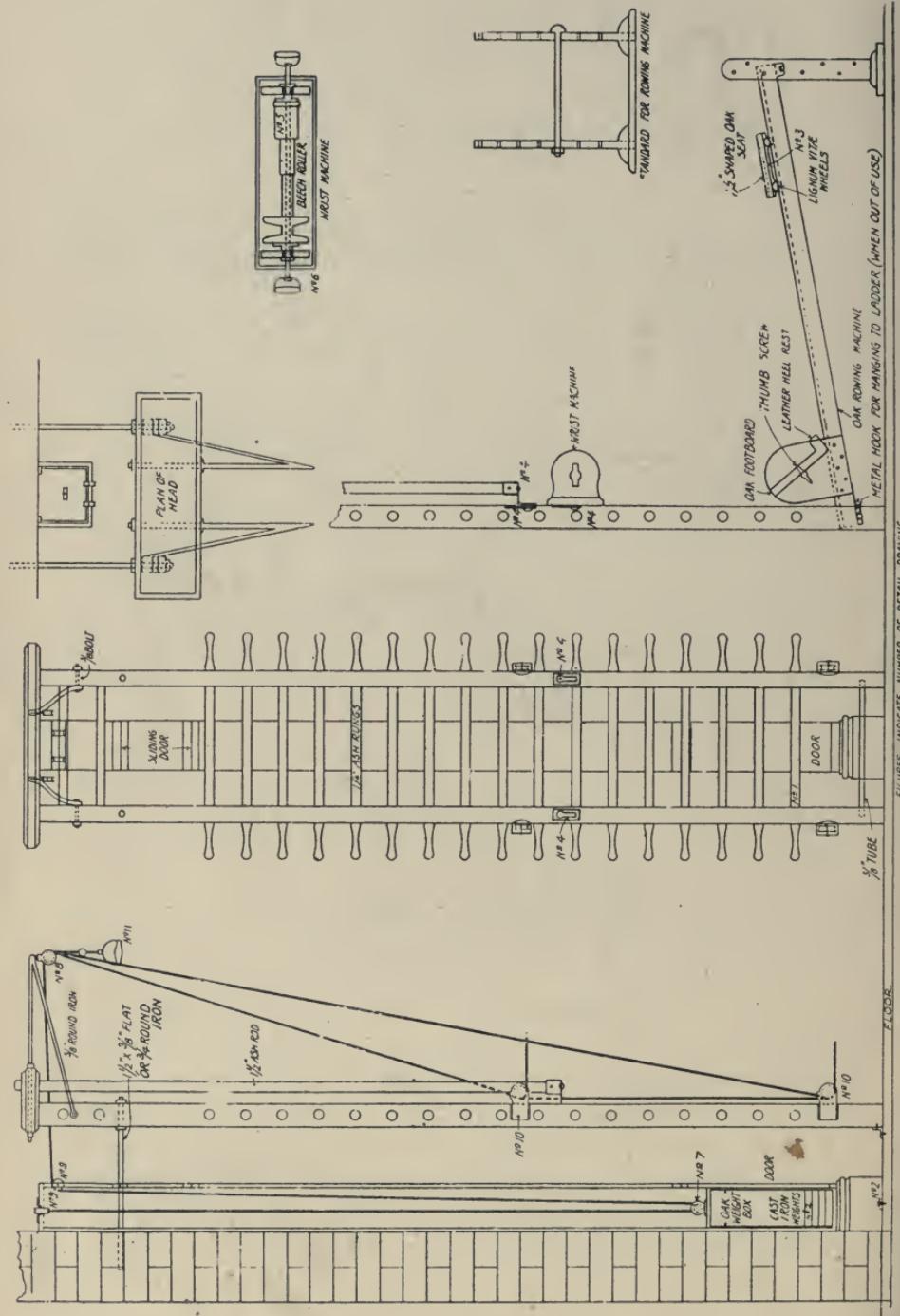
THE apparatus here described is not identical with that illustrated in the text. It represents an improved design (see photograph).

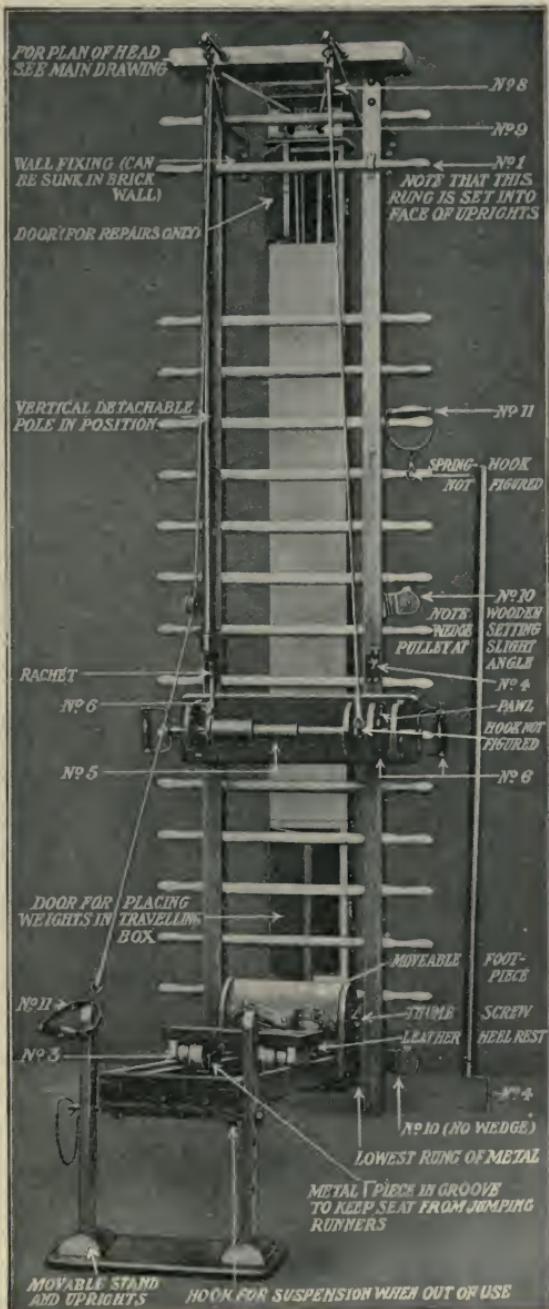
When Sir Robert Jones did me the honour of asking me to take charge of the Massage Department of the Military Orthopædic Hospital, Shepherd's Bush (now the Special Surgical Hospital), I had already seen enough of military practice to be able to realise the relatively small part that massage pure and simple should play, when compared with the vast scope which is open to us for treatment by exercises. It was also apparent that it was quite impossible to secure the services of an adequate number of fully-trained medical gymnasts to look after my prospective patients, and that, therefore, something had to be done to provide the staff with a scheme of exercises which they could master satisfactorily without prolonged training.

The use of apparatus was thus indicated, but it became apparent that, if we equipped our department with the usual outfit, there would be such constant moving about from one piece of apparatus to another that the inconvenience would be very great to all concerned.

I then conceived the idea of elaborating a sort of *multum in parvo* apparatus, and it was at this stage that I first called to my aid the assistance of A. J. Hobbs (A.M.I.C.), R.N.A.S., carpenter to the Hammersmith Guardians. Stage by stage, through months of laborious work, he helped me to perfect the apparatus here figured. Without his aid my scheme would never have materialised at all. Many hundreds of our wounded owe him much ; thousands will do so before all the tale is told. It is to his pen that I am indebted for the whole of the drawings here shown to scale.

The scheme is perfectly simple. The *pièce de resistance*, as it were, is a combined vertical ladder and peg-post. Many





(The figures refer to the detailed drawings,  
pp. 493 *et seq.*)

## Appendix I.

gymnasts would prefer a wider space between the uprights than is here provided. It was found impossible to leave adequate room for all wall-bar exercises. This drawback is of less importance when we remember that the outfit is not intended to replace a gymnasium! It was designed for treatment during the comparatively early stages of recovery only. Two rungs of the ladder are omitted near the top to allow of backward hanging. The rung above the gap is set into the front of the uprights, and not as shown in the drawing. The place of the lowest rung is taken by a metal bar, which serves to support the sliding-seat, and is also of frequent service in various foot exercises.

On the face of the ladder are four metal slots (two only are figured for the sake of simplicity). Into the upper pair can be slipped the lower metal attachment of two vertical poles, while the upper ends pass through the wooden plate which forms the top-piece of the ladder. These not only provide loose rods for the performance of pole exercises, but also enable a patient, who is unable to rotate the forearm into pronation, to perform almost every exercise on the ladder.

Into the lower pair of slots can be fitted the metal pins that are attached to the back of the wrist machine. This is a very simple apparatus, and has this great advantage over those usually found upon the market, that the resistance is adjusted by attachment to the weight and pulley apparatus instead of being regulated by friction. In the base of the hollow wheel (shown at the left of the roller) is a small metal hook (not shown) to which can be attached one end of the pulley cord. To the right of this will be seen the roller which is arranged in three thicknesses. A ratchet and pawl at either end regulate the direction of movement. It is used thus. A patient with stiff fingers is first instructed to place the injured hand on the thickest part of the roller, and, with the sound hand pressing upon it, he simply rolls the hands to and fro. The weights meanwhile are unattached. The process is repeated on each of the two thinner portions as well, and then the thumb is slipped under the thinnest part of the roller, the fingers passing over it. This represents the first attempt to secure a true grip. The two larger portions are tackled successively, and

## Appendix I.

then the weight is attached. The patient now learns to pull up the weights by means of rolling in either direction, and a useful exercise can be added by releasing the pawl and resisting the return of the weight to the ground by the grip alone.

Rotation exercises can be arranged for pronation and supination of either arm by means of the handles at the end (see Fig. 66, p. 135).

The weight-and-pulley apparatus is also simple. Six pulleys are attached to the ladder, three on either side. One is set forward by an iron rod so that it projects over the head of the patient. The other two are attached to the side of the ladder, the lowest near the floor, the other about one-third of the way up. Behind the ladder is a long wooden box, within which is fitted a smaller travelling box containing the metal weights. On the top of the latter is a twin pulley. The cord to which the handle is attached by a spring-hook (not illustrated) passes over the overhead pulley to a second pulley placed on the front wall of the main box. Thence it passes down to the twin pulley on the top of the travelling-box, up to a third pulley on the roof of the main box, down to the other side of the twin pulley, and up to a second pulley placed on the front wall of the main box. From this the cord passes out over the second overhead pulley to the second handle. Thanks to the use of the twin pulley the cord is long enough to allow full use of the apparatus, even if the cord on both sides is led down from the overhead pulleys and behind either of the pulleys attached to the sides of the ladder. The various possibilities are shown in the first drawing. The weights are placed in the travelling-box through the lower of the two doors shown in the main box; while the second or upper door is required solely for the purposes of repair should the rope wear out.

The sliding-seat apparatus consists of a seat provided with four wheels, two on either side, which rest upon two parallel rails. These are joined together by crossbars and the path for the wheels is slightly sunk. From the under surface of the seat projects a pair of right-angled metal bars, the free ends being lodged in shallow grooves on the inner sides of the rails. These ensure that the seat will not "run loose" over the side of the rails.

## Appendix I.

One end of the rails rests upon the metal rod already mentioned as taking the place of the lowest rung of the ladder. The other end rests similarly on a corresponding rod which passes through two wooden uprights. The latter are supported on a movable base-board, and are drilled with seven holes placed opposite to each other. It is thus possible to raise the inclination of the rails from the horizontal to a very considerable angle. To the sides of the rails near the ladder are attached a pair of semi-circular uprights through which pass a horizontal metal bar. This can rotate freely, but its movement can be controlled absolutely by means of a thumb-screw. To the front surface of this bar is attached a plain piece of wood, fitted along the lower border with semi-circular heel rests. This provides a foot-piece that can be adjusted to any angle. It will be seen, therefore, that this apparatus possesses two great advantages over the common marketed designs, namely, that the inclination of the rails can be adjusted to the most suitable angle, and that the foot-piece can be placed in the most advantageous position.

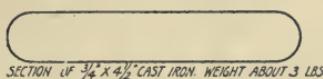
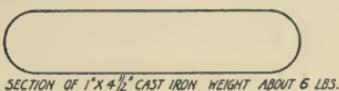
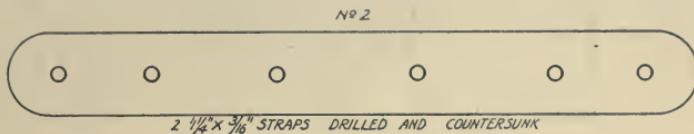
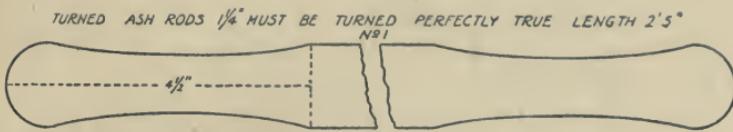
When not in use the loose poles can be suspended from two slots placed one on either side of the top of the main box; the wrist-machine can be suspended from a short metal rod attached to the side of this box, and this runs through a circular hole cut in the wooden back-support of the apparatus; while the under surface of the rails of the sliding-seat apparatus is provided with a metal hook on either side which can be fitted over one of the rungs of the ladder.

The main drawings are shown to a scale of  $\frac{1}{2}$  inch to 1 foot, and the numbers refer to the figures on the subsequent pages. These detailed drawings are all shown one-third full size.

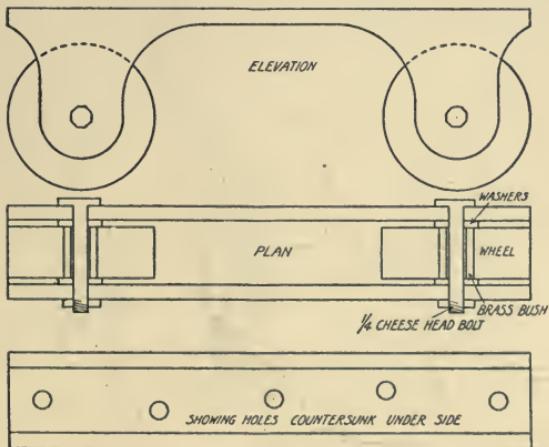
The apparatus has been placed on the market, with slight alterations, by Messrs. Spencer, Heath and George.

The last drawing (No. 12), drawn to a scale of  $\frac{3}{8}$  inch to 1 foot, shows the details of the table we are now using for the flexion deformity of amputation stumps. It has been fully described in the text (see p. 479).

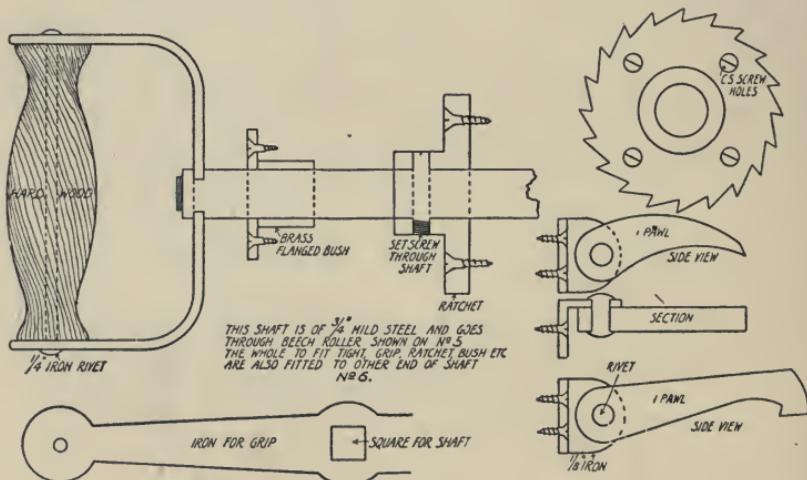
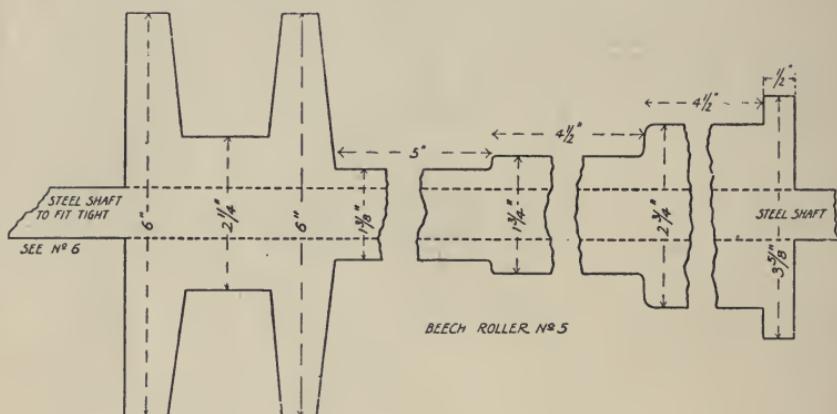
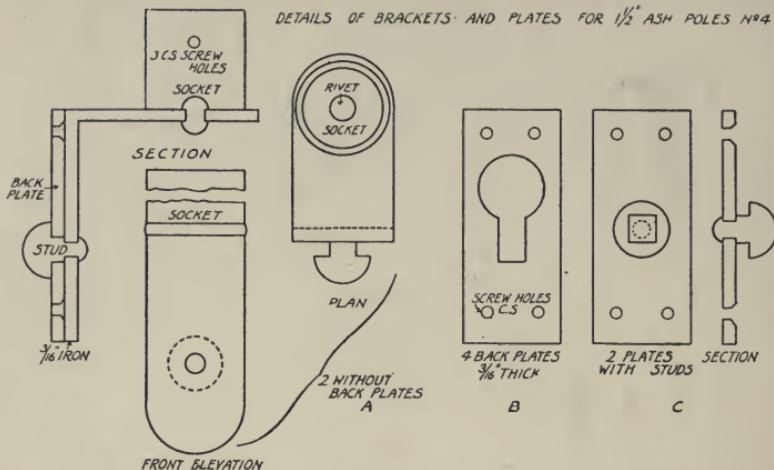
# Appendix I.



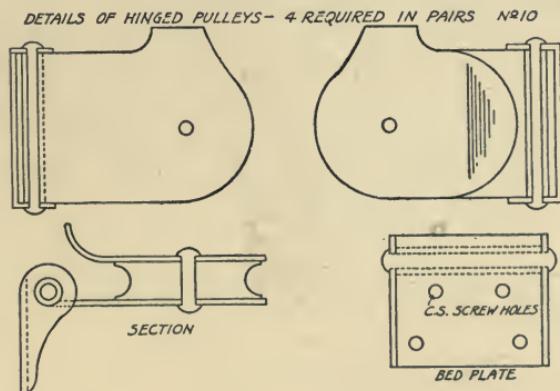
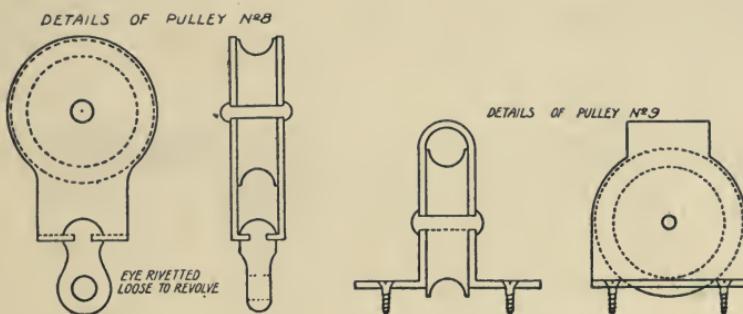
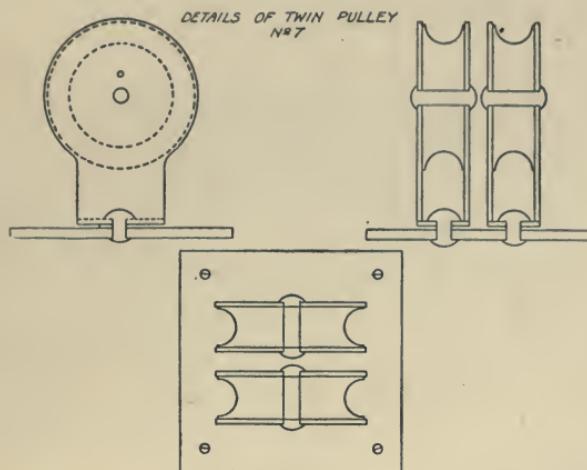
DETAILS OF CAST IRON RUNNERS WITH METAL BUSHED LIGNUM WHEELS N<sup>o</sup> 3



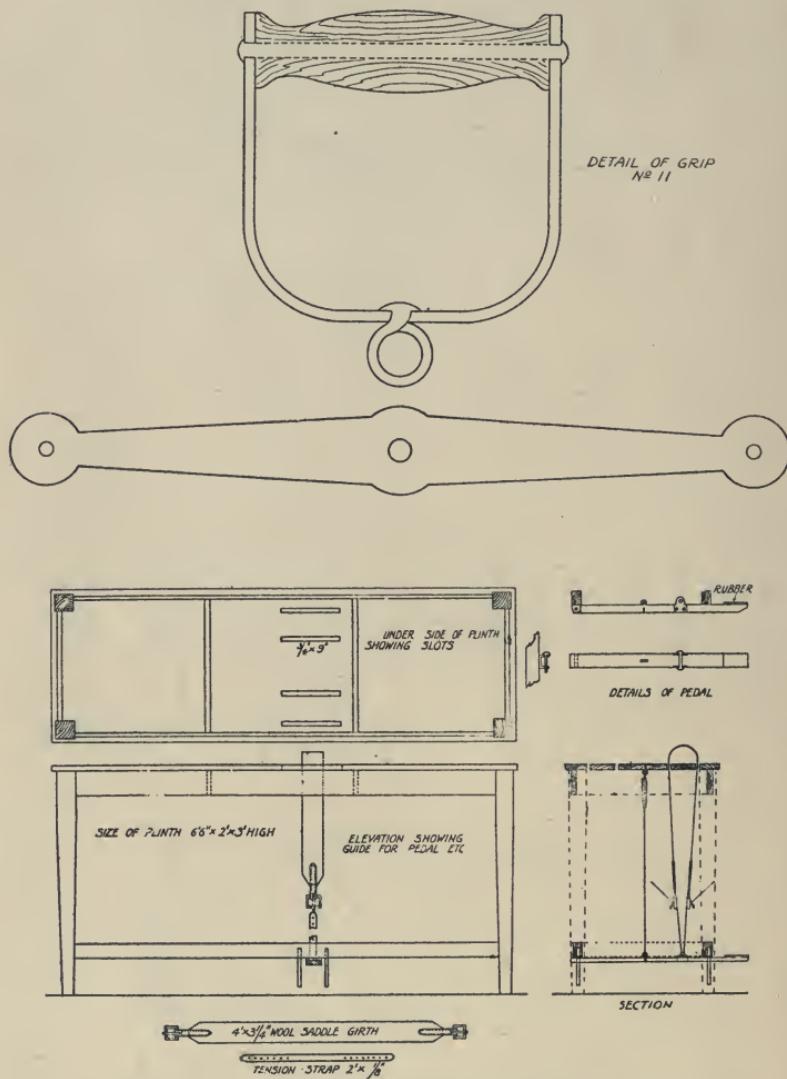
DETAILS OF BRACKETS AND PLATES FOR  $1\frac{1}{2}$ " ASH POLES NO. 4



## Appendix I.



## Appendix I.



DETAILS OF CONSTRUCTION OF THE TABLE USED FOR  
STRETCHING AMPUTATION STUMPS.

## APPENDIX II.

I HAVE received so many inquiries as to what work is done in the elementary class-room at the Special Surgical Hospital that I have asked Miss Simpson (who has organised and controlled this work so admirably since May, 1917) to draw up in rough outline a series of exercises. I am indebted to her for the contents of this Appendix. I was so greatly impressed with the necessity of providing active exercise under trained and skilled supervision at the earliest possible date after the receipt of injury that I instituted these elementary classes for the use of patients who were fit to perform any degree of active movement in safety, but who were, for various reasons, unable as yet to take their place in the gymnasium. The class-room is in fact a sort of nursery in which patients are either tested as to their fitness for the gymnasium, or in which they are trained until fit to proceed there. In an elementary knee class, for instance, it may often be found that not one of the patients in the class is yet allowed to put the full weight of his body on to the injured limb ; in a foot class a man is often found who is not able to stand. Patients frequently attend an arm or hand class while still wearing abduction or cock-up splints. The institution of these classes has, I think, done more than perhaps anything else to impress upon many patients two vital facts : first, that there is really a chance of ultimate recovery, and, second, that recovery depends to a great extent on their own individual effort. This was their object and, thanks to the loyal help and co-operation of Miss Simpson and those who have worked with her, the experiment has received ample vindication.

### SOME EXERCISES SUITABLE FOR CLASS WORK TO INCREASE MOBILITY AND POWER IN :—

Neck and Spine.

Shoulder.

Elbow.

## Appendix II.

Wrist and Fingers.

Hip.

Knee.

Ankle and Toes.

*N.B.—Weight and Pulley Exercises.*—1. With an assistive movement, when the weights used more than balance the weight of the limb to be raised, the movement is relaxed.

By removing the weights a relaxed movement becomes assistive and, finally, a resistive against gravity when no weights are used.

By changing the position of the patient or using a different pulley an assistive movement may become a resistive.

2. Patients with musculo-spiral paralysis should stand with their back to the ladder (see Fig. 143, p. 329).

### NECK AND SPINE.

#### *Free Exercises.*

Head flexion forward, backward or sideways.

Head rotation and rolling.

Relaxed stoop stride standing :—Trunk raising.

Stretch stride standing :—Trunk bending forward and downward.

Wing standing :—Trunk bending forward, backward or sideways.

Wing standing :—Trunk rotation and rolling.

Yard stride standing :—Trunk twisting (quick).

Standing, stoop standing or lunge standing :—Arm stretchings.

Back against wall standing :—Back stretching.

Grasp crook sitting :—Neck and back stretching.

Prone lying, pole grasped behind back :—Trunk raising.

Caterpillar crawling.

Creeping exercises (Klapp).

Breathing exercises (with or without arm movements).

Breathing exercises under tension (see Fig. 150, p. 434).

#### *Ladder Exercises.*

Suspending :—Head flexion backward.

Hanging, back against ladder :—Knee raising.

## Appendix II.

Grasp crook sitting, back against ladder and knees strapped :

—Chest raising.

Foot grasp prone lying :—Trunk raising (with or without arm movements).

Foot grasp prone lying :—Trunk raising and turning.

Stretch grasp lying :—Leg raising.

Hanging, back against ladder :—Fall to arch.

### *Weight and Pulley Exercises.*

Standing with back to ladder, top or bottom pulley :—Arm work in all directions.

Standing, face to ladder, middle pulley :—Arm parting.

Combined weight and pulley and sliding seat (see Fig. 149, p. 405).

### *Nautical Wheel.*

Facing wheel, double grasp, for lateral trunk work.

### SHOULDER.

#### *Free Exercises.*

Elbows flexed :—Arm raising sideways.

Yard lying :—Arm raising sideways.

Lying :—Arm rotation.

Sitting :—Arm raising sideways and rotation.

Standing :—Arm raising sideways, and rotation.

Standing :—Alternate arm swinging forward and backward.

Standing :—Alternate arm swinging in front and behind chest.

Arm stretching in all directions.

Bend standing :—Elbow circling.

Standing :—Arm circling.

Standing :—Shoulder shrugging.

Standing or stoop standing :—Arm swimming.

Prone lying :—Trunk raising (with or without arm movements).

Folding arms behind back.

Prone falling.

#### *Ladder Exercises.*

Reach grasp standing :—Heel raising and knee bending.

Creeping with fingers up fixed pole or up wall, standing facing or sideways (cf. Figs. 100—102, pp. 234, 235).

## Appendix II.

- Creeping as above and then holding the arm up without support.
- Stretch grasp lying :—Leg raising.
- Climbing up with hands and feet.
- Hanging, facing the ladder.
- Hanging, back to the ladder.
- Hanging, back to ladder, heels in :—Fall to arch.

### *Weight and Pulley Exercises.*

- Sitting or standing, back to ladder :—Arm drawing up with sound arm, using single rope over top pulley.
- Lying, sitting or standing, side towards ladder, top pulley :—Assistive arm abduction and resistive adduction (Fig. 58, p. 111).
- Repeat the above, gradually decreasing the weights.
- Standing with working arm away from ladder, bottom pulley :—Resistive arm abduction, assistive adduction (Fig. 59, p. 113).
- Repeat the above, gradually adding weights.
- Facing or back to ladder :—Arm work in all directions.

### *Nautical Wheel.*

- Facing sideways or back towards :—Double or single arm work.
- Facing and grasping with one hand :—Turn under arm and stand with back towards wheel.

### *Wrist Machine.*

- Sitting sideways :—Arm rotation (Fig. 61, p. 115).

### *Exercises with Various Apparatus.*

- Double grasp pole exercises in all directions.
- Single grasp pole exercise for rotation.
- Indian club swinging in all directions.
- Ball or bean-bag throwing, under arm and over arm.
- Skipping, turning rope forwards or backwards.

### ELBOW.

#### *Free Exercises*

- Standing :—Arm stretching in all directions.
- Yard standing :—Arm bending forward and flinging.
- Neck rest standing :—Arm flinging sideways.

## Appendix II.

Hands clasped, standing :—Arm raising to head rest and neck rest.

Hands clasped behind back, prone lying :—Trunk raising.  
Prone-falling position.

Prone-falling :—Arm bending and stretching.

Arm resting on inclined plank :—Elbow extension up the slope.

### *Ladder Exercises.*

Reach grasp high standing :—Arm bending and stretching (Fig. 92, p. 204).

Bend grasp toe fall standing :—Arm stretching.

Stretch grasp high curtsey half standing :—Arm bending and knee stretching.

Hand travelling (hands in pronation or supination).

### *Weight and Pulley Exercises.*

Facing ladder, top pulley, straight pull with sound hand over injured one, elbows close to sides (Fig. 103, p. 236).

Back to ladder, middle pulley, arm pronated or supinated :—  
Assistive arm flexion and resistive extension (Fig. 98, p. 232).

Facing ladder, middle or bottom pulley :—Resistive arm flexion and assistive extension (Fig. 99, p. 233).

### *Wrist Machine Exercises.*

Pronation and supination either free or with weights (Fig. 66, p. 135).

### *Nautical Wheel Exercises.*

Standing facing wheel or sideways working with one or both hands.

### *Exercises on various Apparatus.*

Indian club swinging in all directions.

Double grasp pole exercises in all directions.

Single grasp pole exercise for rotation (Figs. 70 and 71, pp. 139 and 140).

Ball and bean-bag throwing.

Quoits.

Skipping.

## Appendix II.

### WRIST AND FINGERS.

#### *Free Exercises.*

Standing :—Wrist flexion and extension, abduction and adduction.

Arm bending and stretching in all directions with hand closing and opening.

Arm bending and stretching with finger abduction and adduction.

Flexion and extension of metacarpo-phalangeal joints.

Flexion and extension of inter-phalangeal joints.

Thumb circling and opposition.

Yard standing, wrist shaking and rotation.

Prone-falling with, or without, arm bending and stretching.

#### *Ladder Exercises.*

Wrist flexion and extension on fixed pole (Fig. 69, p. 138).

Grasp high standing :—Climbing up and down with hands (feet fixed).

Grasp high half standing :—Arm stretching and knee bending.

Heave grasp slow arm extension with feet off ladder.

Reach grasp toe lean standing :—Arm bending and stretching.

#### *Weight and Pulley Exercises.*

Facing or back to ladder, top pulley, sound hand over injured one (Fig. 103, p. 236).

Work in all directions as for shoulder and elbow.

#### *Wrist Machine Exercises.*

Without weights, working backwards and forwards, sound hand over injured one.

With weights overgrasp or undergrasp (Fig. 68, p. 137).

Rotation without or with weights.

#### *Nautical Wheel Exercises.*

Standing facing, or sideways.

### HIP.

#### *Free Exercises.*

Standing, feet parallel :—Foot turning in and out.

Wing standing :—Leg raising forward, backward or sideways.

## Appendix II.

- Wing standing :—Heel raising and knee bending.  
Marking time with knee raising.  
Marching with knee raising and leg stretching forward.  
Lunging forward, outward or sideways.  
Relaxed stoop stride standing :—Trunk raising.  
Wing forward lunge standing :—Trunk turning.  
Wing stride sitting :—Trunk bending forward, backward or sideways.  
Half crook, half long sitting :—Leg changing.  
Wing high sitting :—Bicycling movements.  
Prone-falling :—Foot walking forward and backward.  
Wing kneel standing :—Trunk circling.  
Prone-lying :—Head bending backward and leg lifting backward.  
Astride jumping.

### *Ladder Exercises.*

- Standing with chair support :—Single leg travelling up and down.  
Grasp high standing :—Alternate leg swinging forward and backward.  
Hanging, facing ladder :—Leg parting.  
Hanging, back to ladder :—Knee raising and leg stretching forward.  
Reach grasp standing :—Heel raising and knee bending.  
Stretch grasp lying :—Leg raising.  
Standing, back to and hips strapped to ladder :—Trunk bending forward or sideways.

### *Weight and Pulley Exercises.*

- Chair support, facing ladder, middle pulley :—Assistive hip flexion and resistive extension (Figs. 54 and 55, pp. 107 and 108).  
Chair support, back to ladder, middle pulley :—Assistive hip extension and resistive flexion (Figs. 56 and 57, pp. 109 and 110).  
Chair support, injured side towards ladder, middle pulley :—Assistive hip abduction and resistive adduction (Figs. 111 and 112, pp. 272 and 273).

## Appendix II.

Chair support, injured side away from ladder, middle pulley:—  
Assistive hip adduction and resistive abduction.

### *Sliding Seat Exercises.*

Maximum slope with foot-piece loose.

Combined with weight and pulley exercises (Fig. 149, p. 405).

### KNEE.

#### *Free Exercises.*

Side lying:—Knee flexion and extension (Fig. 48, p. 92).

Long sitting, heels off ground:—Contraction of quadriceps.

High sitting:—Leg swinging (Fig. 104, p. 266).

Half crook half long sitting:—Leg changing.

Kneeling:—Sitting back on heels (Fig. 124, p. 282).

Standing:—Foot placing in all directions.

Standing:—Foot placing with heel raising.

Standing:—Foot placing with heel raising and knee bending.

Lunging forward, backward and outward.

Standing:—Knee raising and leg stretching forward.

Marking time with knee raising.

Marching and running with knee raising.

Skiping.

Astride and upward jumping.

Wing toe fall out standing backward:—Change to half kneel standing.

#### *Ladder Exercises.*

Grasp standing, knees strapped to ladder:—Sitting back.

Reach grasp standing:—Heel raising and knee bending.

Grasp high half standing:—Knee bending and arm stretching.

Climbing up and down.

Foot grasp half standing:—Knee bending and stretching.

Half wing, half side grasp, half standing:—Knee bending and stretching.

#### *Weight and Pulley Exercises.*

Chair support, back to ladder, middle pulley:—Assistive knee flexion and resistive extension (Fig. 56, p. 109).

Same starting position:—Assistive knee flexion and resistive knee extension with flexion of hip.

## Appendix II.

Sitting facing ladder, knee over stool, top pulley :—Assistive knee extension and resistive flexion (Fig. 52, p. 105).

Sitting back to ladder, knee over stool, bottom pulley :—Resistive knee extension and assistive flexion (Fig. 53, p. 106).

Exercises for abduction and adduction as for hip (Figs. 111 and 112, pp. 272 and 273).

### *Sliding Seat Exercises.*

Minimum slope, foot-piece loose (Fig. 49, p. 103).

Repeat, gradually raising seat to maximum (Figs. 50 and 51, p. 104).

Fix foot-piece and combine with ladder work (Fig. 50, p. 104).

### *Exercises on Various Apparatus.*

Chair support standing :—Rocking (Fig. 116, p. 275).

Standing on and off form.

Walking up and down inclined plank.

Working stationary bicycle.

## ANKLE AND TOES.

### *Free Exercises.*

Sitting, feet crossed :—Clawing (Fig. 110, p. 271).

Sitting :—Alternate toe raising (*cf.* Fig. 109, p. 270).

Sitting :—Alternate heel raising (Fig. 107, p. 269).

Sitting :—Combined toe and heel raising (Fig. 109, p. 270).

Prone-lying, knee flexed to right angle :—Foot flexion and extension.

Side-lying :—Foot flexion and extension (Fig. 47, p. 92).

High-sitting :—Foot flexion and extension.

High-sitting :—Foot circling.

High-sitting :—Bicycling movements (*cf.* Fig. 104, p. 266).

Lying :—Leg raising with foot rolling.

Forward lunge standing :—Front knee circling.

Chair support standing, feet parallel :—Heel raising (Fig. 122, p. 280).

Chair support standing, feet parallel :—Toe raising (Fig. 121, p. 279).

## Appendix II.

Chair support standing, feet parallel :—Heel raising and knee bending (Figs. 122 and 123, pp. 280 and 281).

Chair support, feet parallel and inverted :—Clawing (Fig. 120, p. 278).

Chair support, walk standing :—Rocking (Fig. 117, p. 276).

Long-sitting, feet dorsi-flexed :—Toe flexion and extension.

Forward lunge standing, toes against wall :—Front knee flexion.

Marching on toes. Marching on heels. Marching on outer borders of feet.

### *Ladder Exercises.*

Reach grasp long-sitting :—Hand travelling with stiff knees. Climbing with hands and feet.

### *Sliding Seat Exercises.*

Foot-piece fixed (Figs. 49 to 51, pp. 103 and 104).

### *Exercises on Various Apparatus.*

Walking on inclined plank.

Wing forward lunge on inclined plank.

Standing on form :—Toe flexion over edge.

Long-sitting, feet dorsi-flexed :—Toe flexion on "claw board" (Figs. 153 and 154, p. 445).

Picking up marbles, balls, etc., with toes (Figs. 155 to 157, pp. 446—448).

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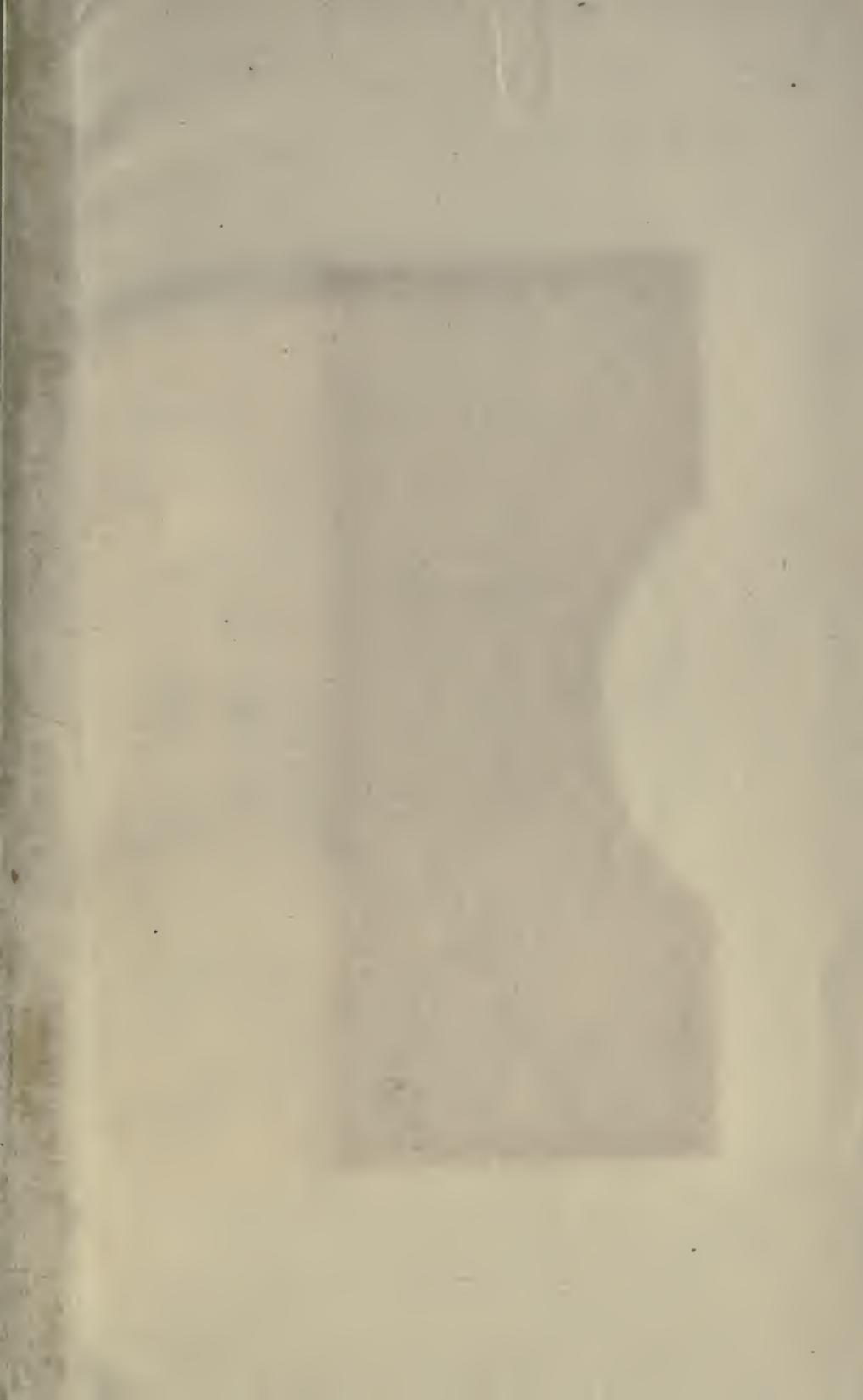
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